HT, MARCH 12, 1936.

FIRST AERO WEEKLY IN THE WORLD

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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Mobilising Industry

ACTIVE steps have already been taken to prepare in peace time for that expansion of aircraft production which would become necessary in time of war. This announcement, made by Lord Swinton at the dinner of the Cambridge University Air Squadron, is a relief from a serious anxiety.

The aircraft industry has recently received orders on a scale such as it has never known since the Armistice, and it is developing accordingly. Almost overwhelmed as it is by the orders, the industry is straining every nerve to rise to the occasion, and before long it will be in a position to turn out aircraft, engines, and accessories at a rate which will be quite satisfactory to the Air Ministry. Even so, it must be obvious to any person who studies the subject that in time of war a much larger output of aircraft will be needed than even the expanded aircraft industry will be able to supply. Fears have been very generally expressed that this vital matter might be left over until it was too late. People have been asking what was the use of multiplying the number of our squadrons and of our immediate reserves of aircraft, if after a month or two of warfare a large proportion of our pilots should be left in possession of no aircraft except parachutes. True, a still larger proportion of the enemy's pilots might be in our prisoners-of-war camps while their machines lay in fragments on the ground, but if the enemy could replace his losses and we could not do so the outlook would be gloomy.

To make preparations for a larger output than one needs in time of peace is a bold step, for it means preparing plant which must remain unemployed or only partly employed until the emergency arrives. The reluctance to take such a step must be greater when it is necessary to go outside the regular aircraft industry and persuade other firms to make plans and prepare plant for turning over to aircraft production when needed. Such a step must be expensive, and yet it is all part of our insurance policy. Therefore it is most gratifying to learn from the Secretary of State for Air that the Air Ministry has faced the situation, and has already entered into negotiations with two firms which are accustomed to production methods on a large scale to prepare plant for aircraft production and to hold it at the disposal of the Air Ministry. The response of those two firms, said Lord Swinton, has been immediate and public-spirited. It may be presumed that further steps of the same nature will follow in due course.

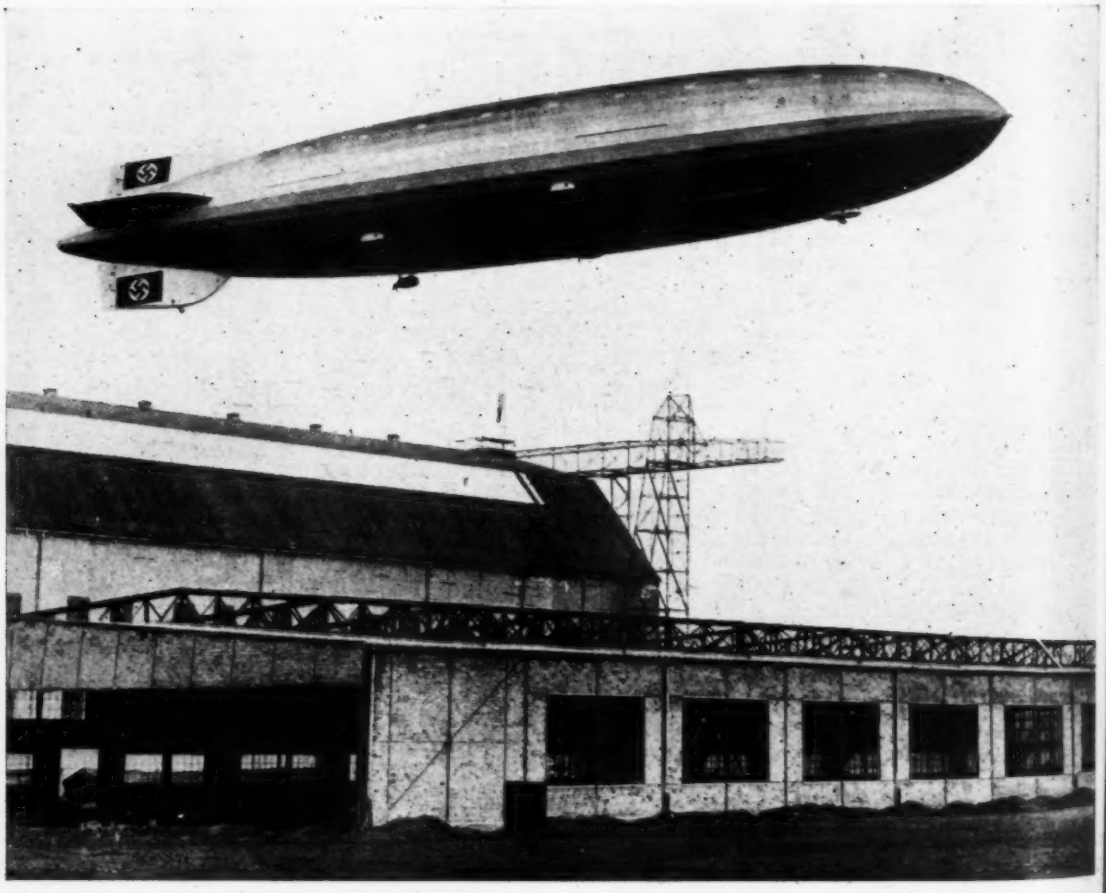
A great deal has been heard of how industry has been organised for the production of warlike material in those countries which rejoice in the rule of dictators. It was one of the points which accentuated the unpleasant uncertainties of the situation. Those countries seemed to hold a trump card which might have emboldened them to bid high in the game of international contract bridge. Britain has now begun to take the step which counters that possible menace, and it is a step the importance of which cannot easily be overrated.

The Air Estimates

AFTER the White Paper on Defence, with its startling announcements of expansion, modification, and novelties, the Air Estimates come as something of an anti-climax. They are concerned more with the wherewithal than with policy. They do not provide moneys for the further expansion announced in the said White Paper, as they will have to be voted in Supplementary Estimates. The Estimates merely show what the cost of the Air Force and of civil flying would have been in the present financial year if the Cabinet had not decided upon a further increase in all the defence Services. The net Estimate for 1936 is £39,000,000, while for last year, after including the Supplementary Estimates, the net Estimate was £11,404,000. That is a very healthy increase, but a great deal more will have to be found. It is indeed a very fortunate thing that this country had reached a state of comparative prosperity before the international situation became so acute as to make this great increase of spending an absolute necessity.

As usual, we prefer to consider the net Estimates rather than the gross figures, as the former give a truer idea of our air strength than is given by the latter. Certainly the net Estimates include the Vote for Civil Aviation, and also for such services as research and meteorology from which both Service and civil flying benefit. The net Vote for Civil Aviation amounts to £760,000, and if we deduct that from the £39,000,000 we get somewhere near to an idea of the cost of our air defence. The gross Estimate includes the sum of £3,066,000 which the Admiralty pays for the Fleet Air Arm, and that arm is part of naval defence, not of air defence. When delicate international situations arise overseas, and it is found advisable to move both Air Force units and naval units to, in this case, the Mediterranean and the lands on its shores, the two sorts of air strength work together. In that case, however, the R.A.F. units sent temporarily overseas are not engaged on their normal and proper work of the air defence of this country, and it is in that form of defence that British citizens are most vitally interested. The net Estimates also include the cost of the army co-operation squadrons, which do the work of the Army, and likewise cannot be reckoned as part of our air defence. It is therefore not at all a simple matter to arrive at the exact sum which we are paying for the air defence of the country. It is, however, desirable that the taxpayer should realise how diverse are the activities which are accounted for in the Air Estimates, and should not be misled by figures of grand totals.

There are some interesting details in the Memorandum which accompanies the Estimates. The term "our Metropolitan air strength" is new, and presumably means the force devoted to the defence of London. Again, one must not be misled by the term "the total strength of the Royal Air Force at Home," for that, as explained above, includes the army co-operation squadrons, which would accompany the Army if the latter went overseas. These five A.C. squadrons are to be "reorganised to provide seven squadrons." That is far from a clear form of expression; but it is hardly credible that the strength of the existing squadrons is to be reduced from twelve to some smaller number of first-line aircraft. Some other squadrons are to have their strength raised from twelve to eighteen machines, as it has been found that a flight of six is a convenient operational unit, and a squadron needs more than two flights. It is confirmed that the Cadre (Special Reserve) Squadrons are to be converted into Auxiliary Air Force units. This step will help the expansion programme, by setting free some regular personnel, but the disappearance of the Cadre squadrons is to be regretted on various grounds. It is also interesting to be told that the catapult units of the Fleet Air Arm may be reorganised. This statement affords food for speculation.



A LEVIATHAN TAKES THE AIR: The L.Z.129 passes over the Friedrichshafen works on its first test flight. The second part of *Flight's* illustrated description of the new airship appears in this issue.

The Outlook

A Running Commentary on Air Topics

The Civil Aviation Vote

WHEN considering the amounts provided in the Air Estimates for air defence one gets the truer perspective by studying the net Estimate; but, when turning to Vote 8, the Vote for civil aviation, it is best to take the gross sum. This includes appropriations-in-aid from the Dominion and Colonial Governments over whose territories the machines of Imperial Airways fly, but all the sums are spent on the same object. Australia manages her own subsidy on the route Singapore-Darwin, and India is proposing to give assistance to Indian National Airways; while each Government makes independent arrangements for helping its own flying clubs. Therefore, to discover the actual amount spent on the Empire air routes, one should deduct from Vote 8 in the British Air Estimates the amounts spent on flying clubs, and should add the subsidies paid out by the Australian and Indian Governments. Without attempting this rather complicated mathematical exercise, we may count it fairly satisfactory that Vote 8 shows a gross total of £908,000 for 1936. The subsidies and grants are less by £70,000 than last year, while all other heads together show an increase of £229,500. When we think of the enormous sums which some foreign countries have spent in subsidising air transport, we must agree that the British Empire gets very good value for a very moderate expenditure.

Empire Route Subsidies

THE comments in the Memorandum on the subject of the civil aviation Vote add very little to what was already common knowledge. The sum of £20,000 provided as subsidy to British Airways for the service to Scandinavia had not been officially mentioned before, but this is almost the only informative item. One notices also the expression "the Empire Air Transport Scheme" with capital initials, which occurs twice, and which sounds like a novelty. Apparently, it applies to the whole network of routes run or to be run by Imperial Airways, together with the new schedule and the proposed new flat rate for Empire air mails. Australia has been threatening to torpedo her end of the scheme, both as regards the route and as regards the mail rate, but negotiations are proceeding, and the Memorandum has nothing to say on the subject. Notice may be taken of an advance of £25,000 for the service from Khartoum to West Africa, which will be repaid by degrees by Nigeria and the Gold Coast; of the contribution of £3,600 by Bermuda to the proposed New York service; and of the invitation to Hong Kong to contribute towards the branch which will connect her with Penang, and so with the service to India and Australia.

Gliders for Defence?

ONE of the minor mysteries of the Air Estimates occurs in the first two items of Vote 3, sub-head A. This sub-head deals with the amounts which it is expected will be required during the present year for aircraft and engines. The amount set aside for complete "airframes" is £8,335,000, as compared with £4,432,000 last year, an increase of £3,901,000, or 88 per cent.

For complete engines the sum required is estimated at £4,525,000 as against £3,891,000 last year, an increase of £634,000, or about 16.3 per cent. It is by no means clear why the money to be spent on aero engines should be a much smaller percentage than that to be spent on aircraft. On the contrary, with the many twin-engined types that have been introduced, one would have thought that the percentage increase would tend to be greater for engines than for aircraft. No solution of the mystery is to be found on the pretty green explanatory pages of the Air Estimates, nor does the Memorandum by the Secretary of State for Air elucidate the position. Altogether, sub-head A of Vote 3 seems to be very much on the Part Publication List. Perhaps the explanation may be forthcoming when, later in the year, the Supplementary Estimates are introduced.

The Music Goes Round . . . .

COMFORT in an aeroplane is very closely bound up with the degree of noise which reaches the occupants. Ventilation is another important item. Unfortunately, ventilation and noise reduction do not go together too well. If one takes endless pains to make an aeroplane cabin soundproof, the opening of a single window can spoil everything and make the cabin noisy again.

Obviously, the problem of providing quiet in an aeroplane cabin resolves itself into two sections: silencing the source of the noise (mainly engine) and the prevention of the residue of the noise from reaching the passengers.

In this issue is published an article describing some of the work which has been done on the difficult problem of silencing aero engines. Private firms no less than the Air Ministry have spent a great deal of time and money on research, and if it cannot be said that silent engines have been achieved, the fundamental problems are at least beginning to be understood. In a subsequent issue it is hoped to describe some of the methods adopted for soundproofing the cabins of aircraft and for securing good ventilation without readmitting the noise so painstakingly excluded.

Permanent Commission Officers

RECENTLY an experiment has been made by sending to Cranwell for a finishing course all University candidates who had been granted permanent commissions. The idea was that all officers holding permanent commissions (except, of course, those who had previously held Short Service commissions) should have the common bond of looking back to Cranwell as their *Alma Mater*. The experiment does not seem to have been a success. Cranwell objected, because the influx of University men gave more work to their staff of instructors, which was not proportionately increased. In other ways the scheme was not very promising. The Flight Cadets spend two years at the College; the University men only spent six months there. The latter were all older than the Flight Cadets, and had received ante-dated commissions to compensate for that loss of service time. They were graduates, and for the most part had taken Honours degrees. It was hardly to be expected that the two elements would fuse to any useful extent.

The experiment is to be abandoned, and, as before, the University men will go to one of the Flying Training Schools for final polishing up before posting to squadrons. The next batch of Cambridge men, for example, will go to Sealand. At the F.T. Schools they will mix with men more of their own age who have been granted Short Service commissions. This produced good results in the past, and will doubtless do so again.

The "kidney" or "ramshorn" type of exhaust system, which gives a noise reduction equal to that obtained with the more usual perforated tail pipes, is standard equipment on certain R.A.F. machines, notably the Handley Page Heyford. (*Flight* photograph.)

IN SEARCH of SILENCE

Exhaust Noise the Chief Problem at Cruising Speeds : Some Hitherto Unpublished Information on Official Engine Silencing Experiments : Modern Proprietary Silencers Reviewed

WHEN a child wishes to convey the impression of an aeroplane it sets about creating an uncivilised booming roar. Any idea of passage through the air is of secondary importance: the aeroplane is primarily a maker of noise. While infant vocal chords are made to suffer in this manner aerial travel will be held in awe or contempt by many people who should fly regularly; the bomber must advertise its presence; protests against nocturnal exercises by the R.A.F. will be arrayed at certain periods in the Press; and scientists must continue to collaborate in their endeavours to restore quiet to the sky.

This article (for many of the data in which *Flight* is indebted to the Royal Aircraft Establishment, Farnborough) is intended as a review of what is being done to silence the aero-engine, the greatest, but not as is popularly thought, the only offender. The high-speed airscrew is highly undesirable if quiet is to be attained, and the motion of the airframe through the air is another source of noise. In an aeroplane which is not aerodynamically clean, such items as wires, struts, venturis and wireless aerials present additional problems.

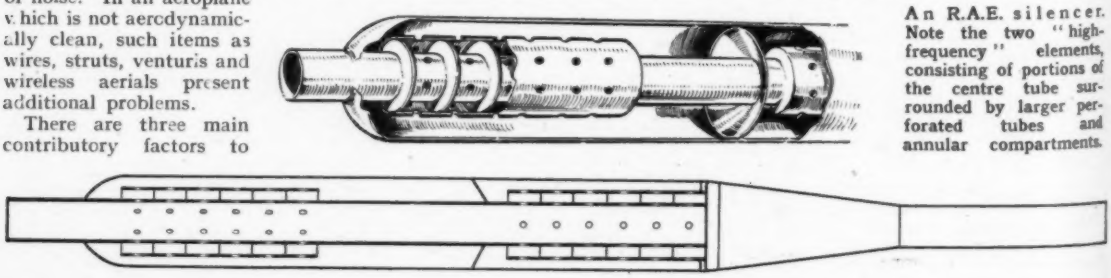
There are three main contributory factors to engine noise: the sound made by the exhausting of the gases; the hissing roar at the intake of the carburetter; and the general clatter of mechanical parts. It has been found that at high speeds the noise of the airscrew is usually greater than that due to the exhaust, but at normal cruising speed the exhaust note dominates. In a number of cases the exhaust noise actually falls below the sound caused by the passage of the machine through the air. Poppet valves are the main contributors to the mechanical noise: the screaming of gears is not so serious as might be expected.

Sleeve-valve Silence

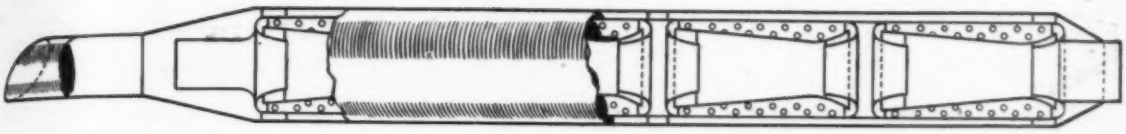
The sleeve-valve engine has effected a considerable reduction in sound. This type of unit has no external moving parts; its valve gear is simplified and is more positively actuated; at the speeds at which it operates its port-opening diagram shows greater efficiency; and its expansion characteristics are claimed to permit the exhaust gases to be released at comparatively low temperature and pressure. Anyone who was present at the S.B.A.C. Display last year when the Bristol Bullpup (Aquila, sleeve-valve) and the Bulldog (Mercury, poppet-valve) were in the air at the same time will remember the comparative quiet of the Bullpup. Noise, incidentally, is apt to give a false impression of speed.

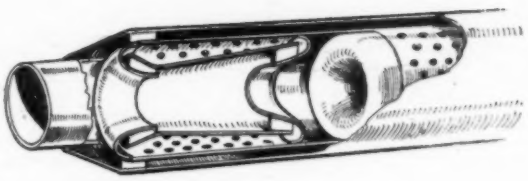
Refinement in the design of various components of the poppet-valve engine will reduce mechanical clatter, and further progress might be made through the introduction of sound-absorbing qualities into the engine cowling.

At this juncture it becomes necessary to give some explanation of the method used in this country to measure aircraft noise. Since sound is a form of energy, its intensity may be expressed as a rate of energy flux, which may be given in terms of the pressure amplitude of sound waves. The response of the human ear to changes of intensity is not linear, but approximately logarithmic, and the system of intensity notation depends upon the decibel, the actual intensity of a sound being expressed as so many decibels



An R.A.E. silencer. Note the two "high-frequency" elements, consisting of portions of the centre tube surrounded by larger perforated tubes and annular compartments.





An example of the latest Vokes venturi-type silencer designed for a Rolls-Royce Kestrel: The number of venturi elements may, of course, be varied.

above some arbitrary zero level. A decibel may be described broadly and briefly as a fractional step—actually 26 per cent.—in sound energy. A sound-level change of one decibel is the smallest loudness change the human ear can detect.

The actual sound characteristics of the exhaust noise are products of the acoustical properties of the cylinder and exhaust ports, which give rise to a band of low frequencies whose maximum is in the region of 200 per second. The turbulent flow of the gases through the exhaust port gives rise to a group of high frequencies ranging from 3,000 to about 8,000 per second. It is essential, therefore, that a silencer should be capable of dealing effectively with both high and low frequencies of varying amplitudes. An absorption silencer of the straight-through type has been found to give satisfactory silencing for frequencies above 1,000 per second, while a simple perforated-tube type is efficient for the elimination of low frequencies.

Among the major problems connected with the silencing of aero engines are the power loss and possible overheating through back pressure set up by the silencing system, and the weight and aerodynamical drag of the silencer.

In 1918 the Royal Aircraft Establishment, Farnborough, was experimenting with aero-engine silencers of the expansion and baffle types which depended for their action upon a combination of the expansion and cooling of the exhaust gases. The results indicated that to silence the exhaust of an engine to any useful degree a silencer weighed from 20 to 30 lb. per 100 b.h.p. engine output and had a volumetric capacity of from 0.4 to 0.6 cubic feet per 100 h.p. engine output. In even the most efficient types anything up to 5 per cent. of the normal b.h.p. was absorbed in back pressure. All types were found to be deficient in eliminating every form of exhaust noise.

Comparatively recently further experiments have been made by the R.A.E. These started with measuring the noise on a variety of exhaust systems and silencers both on the test bed (where arrangements were made for the exclusion of mechanical noises from the observational points) and in flight. Table I gives some of the results obtained.

Consideration was given to the development of a rational mode of silencer design. Two main types of silencing element were considered: the dissipative type, in which the sound energy is reduced by dissipation at a series of baffles or constrictions, and the reflective type, in which the sound is reflected back to the engine. Silencers of the former variety must of necessity bring about a rise in back pressure due to obstruction of the gas flow by the baffles, but the latter type need only exert back pressure because of the necessity for limiting dimensions. Many silencers combine both modes of operation.

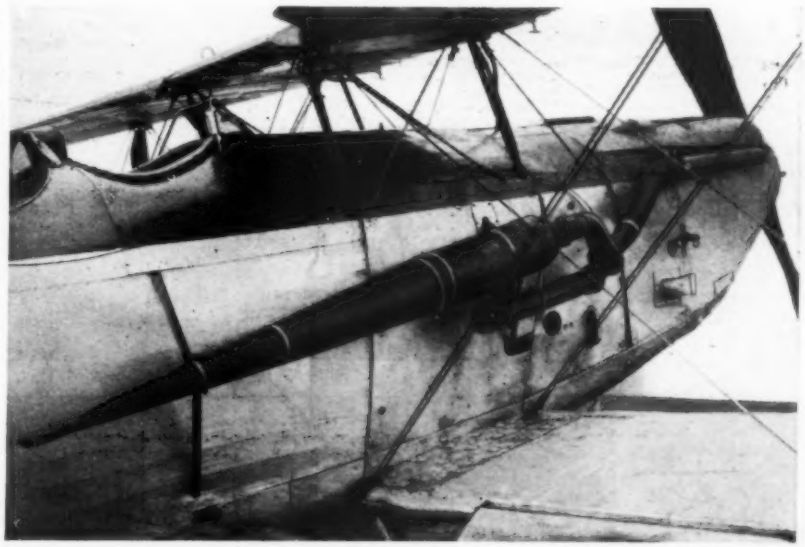
TABLE I.

Exhaust System.	Bench Tests.			Flight Tests.	
	Engine.	Reduction of Noise. Decibels.	Back Press. Ins. Mercury.	Engine.	Reduction of Noise. Decibels.
Stub pipes	—	—	—	Kestrel	0
Ramshorns	—	—	—	"	6
Perforated tail pipe ...	Kestrel	6	1.2	"	6
Stub pipes	—	—	—	Jupiter (geared).	9
Ring type collector and open pipes	—	—	—	"	9

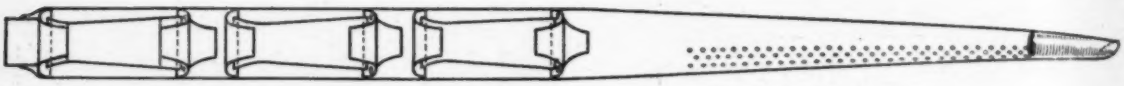
The "ramshorns" mentioned are alternatively known as "kidneys" and are the peculiar "pepper-box" excrescences used on a number of modern Service types.

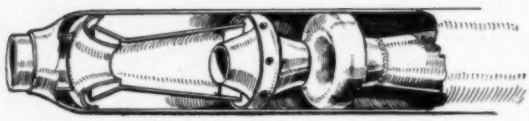
Kauffmann and Schmidt, two German investigators, had proved that the exhaust sound of a small six-cylinder car engine was composed of two main frequency bands separated by a wide band of low intensity. The frequency limits of the two bands were 50 to 700 cycles per second, and 3,000 to 9,000 cycles per second respectively.

In accordance with this knowledge the R.A.E. designed



This is a Vokes silencer on a Kestrel-engined Fairey IIIF which was used for silencing research. The by-passing arrangement to the normal exhaust pipe is visible. (*Flight* photograph.)





For a D.H. Gipsy Six engine of 200 h.p. this Vokes silencer weighs only 6 lb. A similar type has been tried on a Pobjoy engine.

a silencer to attenuate the corresponding frequency bands to be expected from an aero engine. The R.A.E. silencer consisted typically of a high-frequency filter admitting the gas to a large expansion chamber which in turn dealt with the low-frequency band. In practice two such units are usually placed in series to increase the attenuation.

During the same experiments a number of proprietary silencers were tried. For the bench tests each of these was coupled to one bank of a Rolls-Royce Kestrel engine developing 450-500 b.h.p. at 2,250 r.p.m., the exhaust from the second bank being taken to an underground silencer. Flight tests were also made with Kestrel engines and in various airframes. The results are given in Table 2.

TABLE 2.

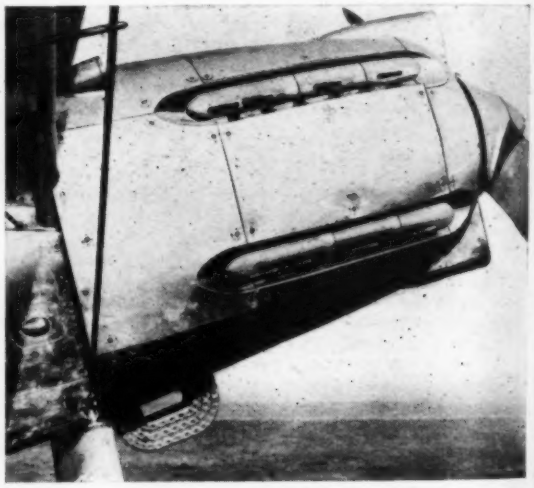
Silencer.	Bench Tests.		Flight Tests.		Weight. lb.
	Noise Reduction at 50ft. Decibels.	Back Press. Ins. Mercury.	Noise Reduction in Aeroplane. Decibels.	Noise Reduction on Ground 500ft. below. Decibels.	
Vokes-Blanvac* ...	26	6.5	10	11	30
Burgess	29	2.5	—	—	33
R.A.E. Type J* ...	26	3.0	8	11	39
R.A.E. Type K ...	25	0.7	8	—	36
R.A.E. Type KL ..	22	0.7	—	21	47

* Satisfactory 50 hrs. endurance tests both on the bench and in flight made with these silencers.

From this table it will be seen that when silencers 1, 3 and 4 were tested in flight a much smaller noise reduction was obtained than on the bench. This, of course, was due to the masking by other noises arising either from the motion of the airscrew or that of the airframe. The fifth silencer was fitted to a 700 h.p. compression-ignition engine with an extremely noisy exhaust, so the benefit of the full amount of exhaust silencing was obtained.

Among the silencers tested was a Vokes-Blanvac type which, like the others, was designed for one bank of a Kestrel engine, or, in other words, for a six-cylinder engine of about 250 h.p. In this type the exhaust entered a large expansion chamber, the shell of which was prevented from resonating with the higher frequencies by having double walls enclosing a layer of asbestos. Thence the gas was directed by a baffle into a second chamber in the shape of a truncated cone, and from this it passed to a smaller cone, finally travelling down a short tube to the exit. The cones and tubes were perforated.

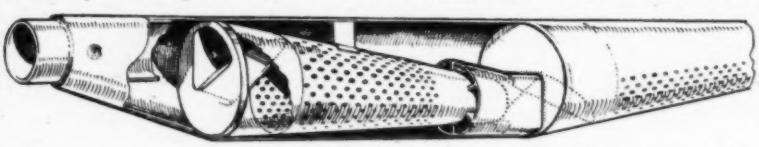
Lately C. G. Vokes and Co., Ltd., have developed a new type of silencer. In this model the gases enter the forward end under high pressure, pass through a venturi structure, and tend to expand toward the rear end of the element where the passage enlarges. They are turned back over the outside of the venturi tube by a metal end cap and, while a certain amount of expansion takes place in a second outer casing, the bulk of the gas is returned at low pressure to the forward end of the venturi and drawn back into the main high-pressure stream by venturi action. The gas in the last chamber of the silencer is withdrawn by a small venturi at the tail end. It is possible, of course, to vary the number of elements as required.



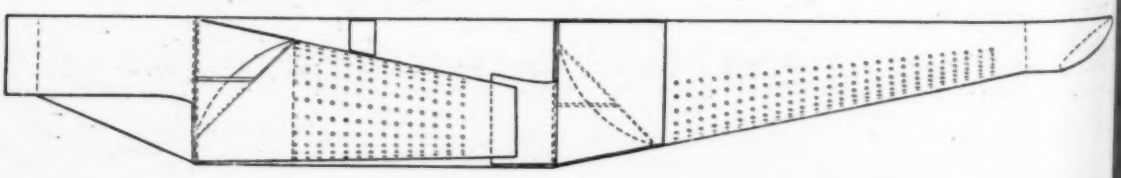
Farnborough and Napier engineers collaborated in the design of the exhaust system for the Napier Dagger III engine in the Hawker Hector. The four exhaust units are sunk into troughs, thereby decreasing resistance.

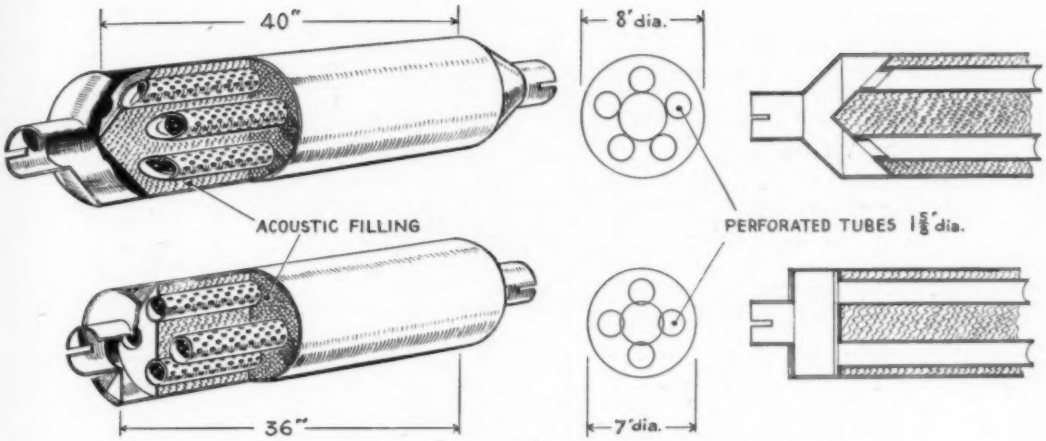
A silencer of this type has recently been tested under official supervision at Farnborough. As at first tried it gave a noise reduction of 20 decibels and a back pressure of 0.55 in. of mercury. One extra element was added, and resulted in a noise reduction of 23 decibels at 50 ft. and a back pressure of 0.8 in. of mercury.

One valuable feature of the venturi-type silencer is that



This is the method used by C. G. Vokes and Co., Ltd., to silence the voice of the French 900 h.p. Gnome Rhone Mistral Major. The normal exhaust collector gives 10 decibels reduction and the silencer another 20 decibels.





Four- and five-tube Burgess silencers, which have lately been tested at the R.A.E.

it can be made up into individual elements which could be housed actually inside a fuselage, nacelle or wing. C. G. Vokes and Co., Ltd., have lately taken out a patent for incorporating the silencer in the leading edge of a wing where its warmth would do a certain amount of de-icing. It is also possible to incorporate it in the exhaust collector ring of a radial engine where it offers no resistance.

For one bank of a Kestrel III engine a silencer of this type weighs 30 lb.—or 24 lb. if 22-gauge material is used. Results given in Table 3, were obtained with the Kestrel III silencer. Actually these tests were made without draught from a fan blast which would give two to three more decibels. The temperatures are estimated.

TABLE 3.

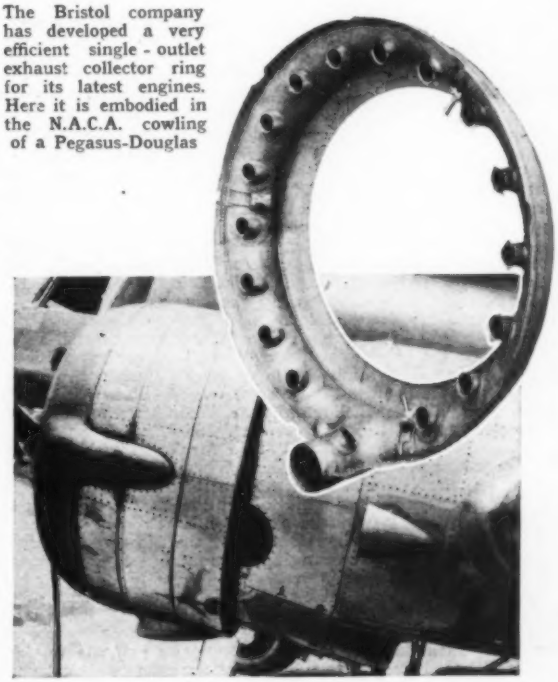
No. of Elements.	Reduction of Sound. Decibels.	Temperature of Silencer.	Back Pressure. In. of Mercury.
4	20	250 deg.	0.555
5	23–27	250 deg.	0.6
5 plus interference box.	26	250 deg.	0.8
4 plus interference box.	22–23	250 deg.	0.555

The Burgess type tested at Farnborough during these particular experiments consisted in its simplest form of a straight tube through which the gas had an unobstructed flow. The tube was perforated and enclosed by an outer shell of considerably larger diameter, the space between being filled with a refractory packing material having sound-absorbing properties. The results given in Table 2 were obtained with a silencer having four perforated tubes in a single shell and a filling of a special form of mica. This silencer dealt with the high-frequency band by absorption and the low frequency by absorption and reflection.

The Burgess H.D.F. type of silencer, the special construction of which combines low-frequency filters with high-frequency absorption tubes, is a type in general use on heavy industrial engines. If applied to aircraft engines it could be expected to give a greater noise reduction than that obtained from the type actually submitted to test. Silencers of this type would be slightly heavier and somewhat more expensive to produce, and until means have been found to reduce airscrew noise, the manufacturers maintain that the simpler and lighter type of Burgess straight-through construction appears to be adequate.

Reference has already been made to the R.A.E. silencer. In this each high-frequency element consists of a portion of the centre tube surrounded by a larger tube, the interspace being divided by cross plates into a series of annular compartments. A number of equally spaced radial holes are drilled through both tubular members in each compartment. The outer shell is divided by a conical baffle into two compartments. This principle of positioning a high-frequency filter at the entrance of a large expansion chamber was adopted to prevent the outer shell resonating with the high-frequency sound, an object attained in the Vokes silencer by the asbestos-lined double wall.

Although they have experimented with various types of silencers for radials, the Bristol company hold the opinion that the forward type of exhaust collector ring offers the most satisfactory solution from all points of view. They maintain that instead of increasing drag it can, in its most modern form, be blended with the fuselage or nacelle in which it is incorporated to form an efficient aerodynamical entry. It can make effective use, without increasing drag, of the available slipstream for cooling purposes, thus reducing the risk of fire in a crash—a characteristic not usually possessed by the rear exhaust collector ring—as well as permitting the exhaust gases to be released at the



The Bristol company has developed a very efficient single-outlet exhaust collector ring for its latest engines. Here it is embodied in the N.A.C.A. cowling of a Pegasus-Douglas

lowest possible temperature and consequently with less volume of sound. A high degree of expansion with consequent fall in the temperature of the gases, as well as efficient flame damping, is permitted by the large internal volume with which it can be made. It is in effect a silencer and flame damper, and forms a good entry to the fuselage. Again, it has the advantage of being of comparatively light construction.

As incorporated in the latest production-type Bristol radials it is of a much larger volume than hitherto in order to deal adequately with the exhaust gases from high-powered engines, is of stainless steel construction and incorporates riveted joints throughout. There is a single outlet which, it is claimed, has the virtue of influencing the gases to travel toward it more uniformly than is possible with the earlier twin-outlet type, thus decreasing turbulence, hot-spots and back pressure, besides promoting an easier evacuation. The outlet can be turned to a position between any two cylinders (excepting between numbers 5 and 6, where the carburetter air intake is situated), thus providing added freedom for designers. Incorporated in the ring is a flexible shock-absorber mounting consisting of three tripods and supporting it upon Silentbloc bushes.

It is claimed by the Bristol company that this ring absorbs a wide range of frequencies and effects a marked decrease in exhaust noise.

The Bristol single-outlet ring is suited for use either with Townend rings or N.A.C.A.-type cowlings, which are usually constructed of three panels secured by toggles, strapped round and supported in front by a register on the exhaust ring, and in the rear by a steel hoop mounted between the cylinders.

A GREAT DAY at CAMBRIDGE

Noteworthy Announcements at University Squadron Dinner : Lord Swinton Foreshadows Important Aircraft Production Developments

THE Cambridge University Air Squadron had a great day last Friday. Its high lights may be briefly set down as follows: the opening of a new open-jet wind tunnel by Mr. H. T. Tizard; the announcement that members are to be allowed to make their first solo flights in term time; the announcement that they would have several Harts at their next camp; the announcement that members are to be allowed to join the R.A.F. Reserve while still up at the 'Varsity; and the statement by the Air Minister that production firms not ordinarily in the aircraft industry are to be invited to prepare plant for the production of aeronautical material and to hold it at the disposal of the Air Ministry. Surely that makes a very full and satisfying day!

In the afternoon Wing Commander F. E. P. Barrington, Chief Instructor, and the members of the squadron were at home for tea in the squadron mess in Fen Causeway, and after tea Mr. Tizard opened the new wind tunnel in the instruction hangar. In his enthusiasm he pressed the rheostat lever over so energetically that he blew all the fuses, but they were soon replaced. The tunnel is of the open-jet type, but can also be closed in. The motor is placed outside the building, which saves valuable space and reduces noise.

A Mighty Gathering

In the evening the squadron and its guests gathered for the annual dinner in the University Arms Hotel, and a mighty gathering it was The order of the day was evening dress with black waistcoats (on account of official mourning) with decorations, and a great record of gallantry and public service was made manifest for all to read. For instance, it is possible that not everybody has realised that our Air Minister won the Military Cross in the war, but seeing the miniature on the lapel of his coat brought the fact home to one. Another reflection, some might call it a sinister one, also inevitably came to the mind. As one looked at the undecorated lapels of the undergraduates one wondered how many of them would bear decorations for gallantry before all is done.

The hundred-odd members of the squadron were well-nigh swamped by the number of distinguished guests. In addition to Lord Swinton, faithfully attended by Sir Christopher Bullock, there were present the Chief of the Air Staff (Air Chief Marshal Sir Edward Ellington), the Vice-Chancellor of the University, several heads of colleges, Air Marshals Sir John Steel and Sir Frederick Bowhill, two Air Vice-Marshals, and Air Commodores, Group Captains, Wing Commanders, and lesser fry without number. In the general class of " heads of colleges " one should not omit to mention that there figured one Field Marshal (just to keep the Air Marshals in countenance), namely, Sir William Birdwood, the Master of Peterhouse, who, though representing *toga* and not *arma*, was actually the senior officer present.

The chef of the hotel did himself and the guests proud; and when, as Homer said, they had put away from themselves the desire for meat and drink (but was Homer strictly accurate about the second item?) they cut the 'osses and got to the cackle. That, however, is a libellous misquotation (not from Homer) for the speeches were first-rate in matter and in wit.

After the loyal toast, the Chief Instructor recounted the progress of the squadron in the past year. They had found a satisfactory field for practising forced landings. That was good, but still better was the announcement that the University authorities had decided to allow members to make their first solo flights in term instead of having to wait for camp. That would be a great saving of instructors' time, and would prevent really competent pilots from getting stale through waiting for their freedom. He said that eleven additional members had been admitted to the squadron; that is to say, third-year men who were applying for permanent commissions. During the year fourteen members had been offered permanent commissions, four had been commissioned in the Auxiliary Air Force, and three others had applied to join the new squadrons which are being raised.

It would be delightful to print Lord Swinton's speech in full, for it was very witty. He described the C.U.A.S. as an " Aeronautics Co-operation Squadron." It had co-operated with Professor Melvill Jones in some very remarkable work. Lord Swinton then declaimed with vigour against foolish people who were opposed to research. General research was necessary for the problems of to-morrow. The day that research failed, the aircraft industry would forgo the proud position which it now held. The co-operation of scientists, the aircraft industry, and the Air Staff was one of the greatest things in the world.

Harts for the C.U.A.S.

Lord Swinton went on to say that for the R.A.F. Reserve he wanted 600 *ab initio* pilots this year, 800 next year, and 800 more the year after. He promised the C.U.A.S. that for their next camp they should have several Harts, and " Don't crash more of them than you need." He wanted to arrange that members should be allowed to join the Reserve while they were still up at Cambridge. Then he made a strong appeal to the employers of the country to allow men to attend annual training in the Reserve and the Auxiliary Air Force without having to sacrifice their annual holiday. It did not matter about pay during the training; *he* would pay them enough; but they ought to get their holiday as well as their time off for training. It would be the greatest contribution which employers could make to the insurance of their business.

The aircraft industry was developing now, he said, as it had never developed before—for it had never before had such large orders. But—here came the greatest announcement of the day—he was arranging for firms outside the aircraft industry, which had experience of large production, to set up now and to hold at the disposal of the Air Ministry large plants for the production of aeronautical material. He had already seen two such firms and had made the proposal to them, and their response had been immediate, warm, and public-spirited.

Lord Swinton ended by saying that he would continue to work on for a limitation of armaments and a peace pact, but they had no chance of success unless we could play the necessary part in defence. What we were doing in building up our Air Force was the greatest guarantee of peace.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

INFRA-DIG : Natives wait behind the hills for hours while R.A.F. machines in Egypt do their gunnery practice. As soon as the shooting has stopped they dash to the targets, grub for bullets in the sand and sell them at two-pence farthing per hundred to dealers. Here is a Vickers Vincent at practice.

CIVIL air services in Italian colonies have been placed under the control of the Air Ministry in Rome.

Flying schools, and ground training units of the R.A.F., are using films to help in training pupils.

Group Capt. W. H. Primrose, who was the first Air Mail Adviser appointed by the G.P.O., has resigned.

The Heinkel He. 70a purchased by Rolls-Royce, Ltd., has been fitted with a Kestrel. It is now in Germany.

The French Academy of Sports has awarded a gold medal to Miss Jean Batten for her South Atlantic crossing.

In order to effect travelling economies in certain territories British air attachés to some countries are to have aeroplanes.

Among the many exhibits at the Leipzig Technical Fair are fifty-seater bomb-proof cellars furnished with air-purifying apparatus, airtight doors and seats.

Twenty-five Years Ago

(From "Flight" of March 11, 1911.)

"Very fair success was attained on Tuesday during trials over Filey Sands with the Blackburn monoplane. Mr. Hucks ran the machine for three miles along the sand, just to see that everything was in order. Then, on the elevator lever being moved, the monoplane took the air, and rising to a height of about 30ft., headed for Filey Brigg, at about 30 m.p.h."

A New S.S. Fighter

Great things are expected of the new single-seater fighter recently "launched" by the Vickers-Supermarine Works, and now undergoing its flying tests. The machine is a low-wing monoplane incorporating all the latest features, and is fitted with the Rolls-Royce Merlin.

Commercial Kestrels?

It is almost certain that the three Junkers Ju. 86 twin-engined monoplanes for South African Airways will be fitted with Rolls-Royce supercharged Kestrels of an improved pattern.

A RECORD FOR FAIRCHILDS : Mr. Sherman M. Fairchild with the largest single-unit aerial camera in the world. It has nine lenses, weighs 305lb. loaded and stands more than a yard high. From 30,000 feet, at one click of the nine electrically operated shutters, it photographs an area of 600 square miles.

Their Muses Flew Not

It is announced that no prize will be awarded in the £500 aviation book contest recently organised jointly by two prominent publishing firms here and in America. In the opinion of the judges, Sir Philip Sassoon, Mr. David Garnett and Mr. Grover Loening, no manuscript submitted reached a high enough standard.

Canada Criticised

The Canadian Government came in for sharp criticism for its attitude to commercial aviation in an address by R. J. R. Nelson, of Halifax, who stated that Canada is without a national policy on aviation, and remarked that while the United States is developing a trans-Pacific service, and Great Britain a trans-Atlantic service, Canada just marks time.

A Cardinal Flies

Cardinal Schuster, who is over seventy years of age, made his first aeroplane trip from Milan to Rome a few days ago in order to pay a visit to the Pope, and was so impressed that he has decided to return by the same method, and to adopt the aeroplane for his further travels.

The Pope's Interest

The Pope is understood to have expressed to the Cardinal his own desire to use the aeroplane should he decide on some long trip. "Some of my predecessors thought the motor car would never be used by a Pope; it would be wrong for me to think that future Popes—or, perhaps, even myself—will not use the aeroplane for long-distance travelling," his Holiness is understood to have remarked.

BACK and FORTH

Rose (Falcon) and Llewellyn (Aeronca) Fly Respectively From and To South Africa

THE Cape-England record has been broken by Flt. Lt. "Tommy" Rose, who can now claim to have made the fastest time for the trip both out and home. His new record is 6 days 6 hr. 57 min. (he got to the Cape in 3 days 17 hr. 37 min.), which beats F/O. David Llewellyn's time—the previous best—by 5 hr. 6 min. Just to keep the pot boiling, Llewellyn has now flown to Johannesburg in an Aeronca with a J.A.P. engine of only 40 h.p. Rose, of course, was using the Miles Falcon "— LC" (Gipsy Six 200 h.p.).

Leaving Capetown at 6.8 a.m. (G.M.T.) on Tuesday, March 3, Rose's first homeward stage was to Salisbury, where he landed 12 h. 52 min. later. On the next "hop" he suffered a setback. He took off from Salisbury at 4.45 a.m. (G.M.T.) and headed for Kisumu (Kenya). Low visibility caused him to return, however, and his second start was not made until 10.45 a.m. The Falcon landed at Salisbury at 7.10 a.m. (G.M.T.), which meant that it had covered 3,354 miles in under 2½ days. Only 2 hr. 20 min. were spent at Kisumu before setting out on the next long stage to Cairo.

Early on Saturday morning he left for Benghazi, the take-off point for the Mediterranean crossing. Here he met a second formidable obstacle. The Italian authorities had given notice that certain areas in Italian Tripoli were closed to civil aircraft, and this caused him to be temporarily detained. On learning of his predicament, friends at home communicated with Mr. Harold Perrin, Secretary of the Royal Aero Club, requesting his diplomatic aid. Commander Perrin cabled direct to Marshal Balbo soon after midnight on Saturday, and it was not long before "Tommy" was heading for Cannes with ample time still in hand. He refuelled *en route* at Tunis (2.26 p.m., G.M.T.) and landed at Cannes at 4.30 p.m. Here he rested for a night, finding sufficient time to try his luck at the tables, and on the morning of the sixth day out started for Croydon, where the Falcon touched down at 11.5 a.m.

The equipment of the Falcon and its Gipsy Six engine included the following:

Flt. Lt. Rose looked fresh and well on reaching Croydon last Monday.

F/O. Llewellyn with the 40 h.p. Aeronca which carried him on a demonstration trip to Johannesburg.

Shell fuel, Castrol oil, K.L.G. plugs, Claudel-Hobson carburetter, B.T.H. magnetos, Fairey metal airscrew, Auto-Klean strainers, Peto and Radford battery, Weyburn camshaft, Wellworthy piston rings, D. J. Hawkins tanks, British Aluminium cowling and fairings, Palmer wheels and tyres, Bendix brakes, Reynolds undercarriage tubes, Salter springs, Bamberger spruce, Saro plywood, Titanine dope, Smith's instruments, Short and Mason Sestrel compass, Sperry blind-flying instruments, Lancegaye safety glass, Rhodoid cabin top moulded by Plastilume Products, Rumbold upholstery, Harley landing light, and nuts and screws by Brown Bros. and Rubery Owen.

The Itinerant Demonstrator

On February 7 Mr. David Llewellyn left Lympne in an Aeronca high-wing cabin monoplane with a J.A.P. engine of 40 h.p. He reached Johannesburg on Sunday, March 1, having given numerous demonstrations of his machine *en route*.

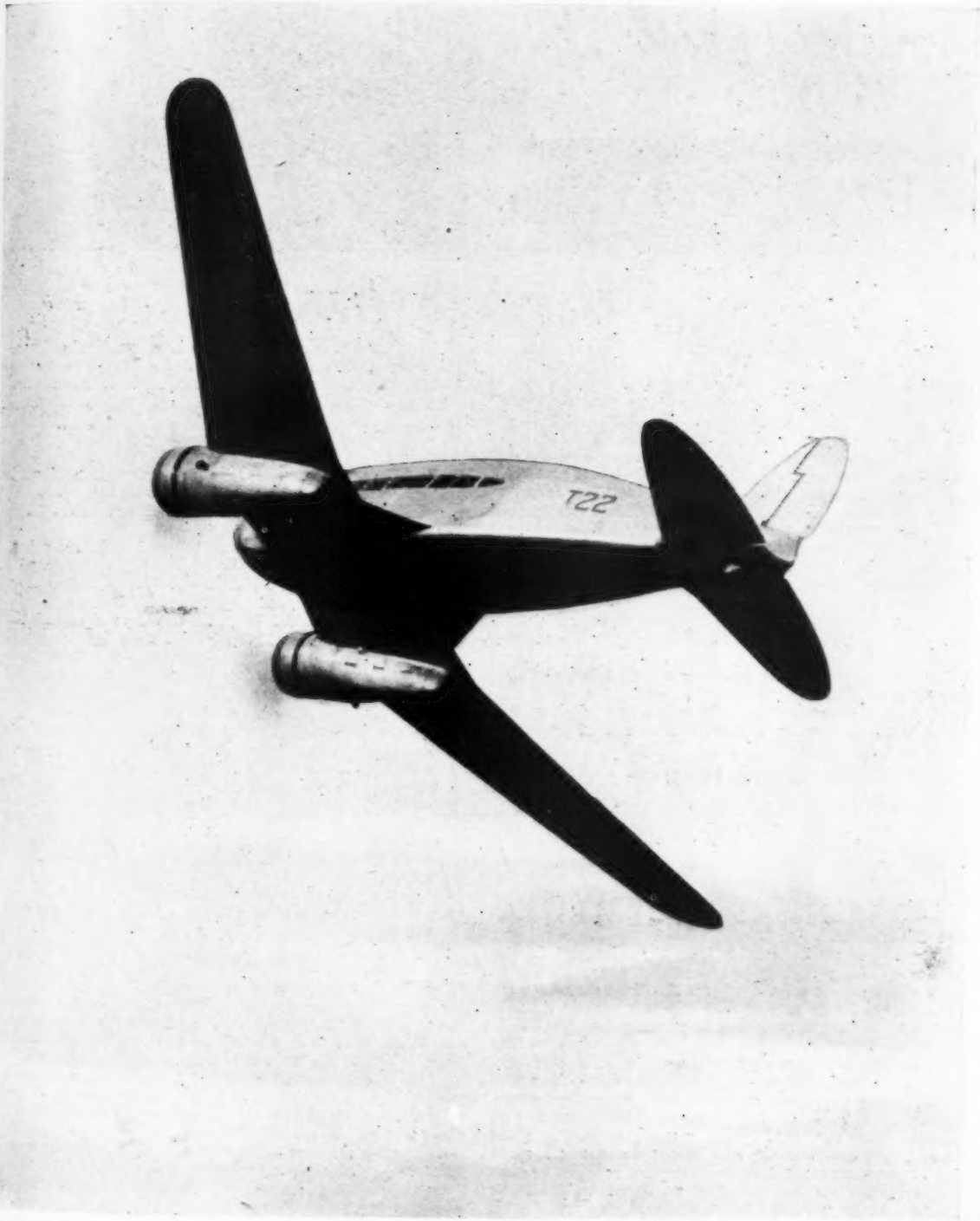
The Aeronca reached Lyons on the evening of February 7. Next day it arrived at Marseilles, on the 9th at Pisa, and on the 10th reached Rome, whence Llewellyn pushed on to Naples. Next day he touched at Palermo and headed for Gabes, but returned owing to adverse weather. He spent the 12th at Palermo, reached Gabes on the 13th, Tripoli on the 14th, and on each subsequent day landed at Sollum, Cairo, Wadi Halfa, Khartoum, Juba and Kisumu. From February 21 to 25 there was no news of him, but on the 26th he reached Mbeya, on the 27th he was at Mpika, on the 28th at Bulawayo, and landed at Johannesburg on March 1.

The story that he had engine trouble is, it is stated, untrue. It seems that he ran into a tropical storm when he was crossing a mountain range in Northern Rhodesia. Finding it impossible to encircle, he landed in a clearing at 6,000ft. There he fitted high-compression pistons to his engine, trimming the ring gaps with a nail file.

The equipment of the Aeronca and its J.A.P. engine included the following:

Castrol oil, Shell fuel, Duckham's upper cylinder lubrication, Lodge plugs (single ignition), Bosch magneto, Rumbold upholstery, Goodyear tyres, Lewis Berger & Sons paint and Rollason tanks.

PUTTING the S.T.18 THROUGH its PACES



Flt. Lt. Schofield has been carrying out extensive flight tests during the last few weeks of General Aircraft's new ten-passenger monoplane. Of all-metal construction, it is fitted with two Pratt and Whitney Wasp Juniors. The photograph brings out the pronounced sweep-back given to the wings; the very low setting of the tailplane on the fuselage is another unusual feature. For this, the first aerial photograph of the S.T.18 to be published, the machine was piloted by Flt. Lt. Schofield, and Mr. Seth Smith handled the S.T.10 which carried *Flight's* photographer. The medium-supercharged engines ensure good performance at high altitudes and yet in conjunction with the Hamilton C.P. airscrews an excellent take-off. The rearward retracting undercarriage is not the least interesting feature.

Private Flying

Topics of the Day

Earning the Subsidy

ON a good many occasions I have given one or two reasons why club pilots so often lose interest as soon as their licences have been obtained, and I have tried to suggest how this interest may be held.

Although it is very nice for a club to obtain the subsidy, it is nicer still to obtain the sum for each licence renewal, and, in all honesty, a club's work under the subsidy scheme does not end with the mere mechanical production of uselessly licensed pilots. These pilots should be encouraged to remain in practice and to pile up hours as far as their incomes permit.

The subject has cropped up again in my mind after reading a certain club's monthly bulletin, in which it is stated quite clearly that most of last month's flying was instructional, and that very few licensed pilots did any flying at all.

Now, it is no use blaming the members. Some of them may be bankrupt, and nothing will get them into the air, but the others merely find that flying around does not amuse them or that the club itself has no attractions.

Bored Pilots

ADMITTEDLY, it is extremely difficult to prevent a pilot with, say, ten hours of solo experience, from becoming bored. He cannot be allowed to go alone on cross-country trips, and he must usually be given a couple of rounds or so before he is even allowed to encircle the same old aerodrome by himself. As one who found life extremely tedious during that period, I can sympathise with the truants.

Something must be done to keep them interested. At the time when my flying *ennui* was at full strength I was lucky enough to be a member of a club with an instructor who was filled with a positively religious fervour towards various little navigational and aerobatic points, and had, furthermore, just worked himself into a frenzy over the business of instrument flying. I took a little of everything all at once, and managed to while away the hours in such a way that I was quite surprised when the instructor said, "Take —MG to Puddlewick, Muddlewick, and back. Watch the revs." Life was very exciting, since I was forced to obtain my own met. reports, and I made that cross-country flight on the compass, refusing to take any comfort from the fact that an enormous landmark stretched between P. and M. I was a Navigator.

As one who was seriously frightened by the Great Racer at Wembley, I don't take too kindly to aerobatics, though I am proud of my slipstream-hitting loops and my stalled turns, but there are lots of novices who can be interested in such things rather than in the more serious affair of getting about—for which, one imagines, the aeroplane was invented.

In modern flying methods there is so much of extravagant interest that it is difficult to imagine that anyone could be bored. It is the instructor's job to see that his pupils do not lose heart.

Cramming

THERE are, of course, extremes of everything. A pupil can be so ignorant that one wonders at the training he has received, or he can be crammed with so much information that he is unable to digest it.

Let me quote two examples. When I had done a bare ten hours' flying I went up as a passenger with a pilot who had done fifty hours or more. He practised steep turns with me, and we discussed them in the air. He did not understand the fact that the elevators tightened the turn at steep angles, and that the rudder became something of an elevator. His turns were being made with almost full rudder and full elevator. Why the pilot did not get into trouble is something of a mystery. He is still alive.

At about the same period I was given landing circuits by a new instructor, who, in the midst of a medium-steep turn, told me about the same problems, but he talked so fluently about "top rudder" and "putting the controls in a spinning position" that I understood nothing, and thought it all out for myself later on. I had, in fact and in ignorance, been doing just what my amateur pilot had been doing—but through clumsiness rather than ignorance.

Obviously, the complete novice must be told about the more involved problems on the ground and not in the air.

Out and Home

TALKING about problems, there is one perfectly simple one which tends to defeat quite technically able people. Only a fortnight ago I was arguing with a sane and sensible individual about the effect of wind upon out-and-home speeds. He started the discussion by complaining that the Blank aircraft in last year's Blackfriars Cup race, over a triangular course, had failed to make the speed claimed as a maximum by its makers. During this race there was a 15 m.p.h. wind blowing, and it was only after sketching an exaggerated case that I could make my interlocutor see that the lap speed would naturally be lower than the actual air-speed—and lower in proportion to the slowness of the machine.

My exaggerated case concerned a hundred-mile out-and-home course, a 100 m.p.h. machine, and the two conditions of still air and a 50 m.p.h. wind blowing straight down the course. In still air the machine's average would be 100 m.p.h.; in the high wind its average could not be higher than 75 m.p.h. Work it out for yourself if you don't believe me!

INDICATOR.

FROM the CLUBS

Events and Activity at the Clubs and Schools

LONDON

LAST week's flying times amounted to 57½ hours. Mr. E. A. Goldsmith completed the tests for his "A" licence, Mr. A. J. Moffat obtained his "A" licence, and Mr. E. A. Robinson made his first solo flight.

CASTLE BROMWICH

During the week ending March 6, 15 hr. 55 min. dual and 6 hr. 10 min. solo flying was logged.

READING

There are three newcomers to the school, these being Miss Edmunds and two pupils from Vienna.

LIVERPOOL

Major J. P. Nickalls is now the secretary of the Club in place of Mr. C. W. Binks. Thirty hours twenty-five minutes were flown last week. The annual dance was held on February 28 and was attended by 234 members and friends.

LEICESTERSHIRE

Flying time has been well maintained in face of unfavourable weather. Forty-six hours fifty minutes were flown in February. Mr. F. C. Campling became a member. The annual general meeting was held on February 21 in the clubhouse.

HANWORTH

Last week's flying times aggregated 38 hr. 5 min. Mr. Murray became a member, Messrs. E. Silling and E. K. Portman Dixon went solo, Miss B. Russell passed her "A" licence tests, and Mr. R. Everett is taking blind-flying instruction.

REDHILL

Mr. Beaumont has completed his "B" and Mr. Heale his "A" licence tests. The Fox Moth is again in commission after C. of A. and is available at £2 per hour to club members. Forty-five hours thirty minutes were flown during the week ending March 6.

PORTSMOUTH

The results of a landing competition held last Sunday were (1) Mr. E. Hills, (2) Mr. A. P. McKee, (3) Mr. W. N. Davis. Last week's flying times totalled 22 hr. 15 min. The annual dance will be held on Friday, March 20, at 9 p.m., at the Pavilion Ballroom, Clarence Pier.

BORDER

One machine may be out of action until the end of April because of the proximity of C. of A.s. The last few days have seen the drying-up of the flooded aerodrome by strong winds, allowing a larger area for landing and taking-off. Mr. Mason has joined the Club as an associate member.

BRISTOL

While one of the B.A. Swallows is out of commission the Moth Major has been put into service again. Miss K. G. O'Grady and Mr. P. A. G. Murray became members last week. Tickets are now on sale for the Aviation Ball to be held on April 24. Last week's flying time was 18 hr. 55 min.

HERTS AND ESSEX

During the fortnight ending February 20, 119 hr. 40 min. flying was done at Broxbourne. Messrs. Glynne Williams, Toye, Prowse, Catton and Gelling became members; Mr. Atkins went solo; and Messrs. Tomas, Sankey, Veale and Saward completed their "A" licence tests. The total flying time for February was 267 hr. 47 min.

MAIDSTONE

The West Malling Aero Club flew 36 hr. 45 min. during February. Mr. J. G. Guild took his "A" licence, Mr. D. A. Doughty went solo, and five new members joined the Club. Mr. John Dade, the instructor, flew to Plymouth and back on a charter trip and also passed the Second Class Navigator's examination. Mr. J. K. Lawrence has transferred his Aircraft Hire Company to West Malling.

CINQUE PORTS

Mr. W. E. Davis, the managing director, and his wife have returned from Madeira and Mr. Leslie Cliff and Mrs. Cliff from the Continent. The latter couple came third in the world's skating championship at Paris. It is gratifying to know that in spite of bad weather the flying hours are still up on the corresponding total for last year. Mr. A. W. Bodfield has joined the Club to take his "A" licence.

BROOKLANDS

Last week's weather again kept flying times low except on Thursday and Sunday, when records for the year were made. After lunch time on Sunday twenty hours were put in. Mr. Appleby, after being held up nearly all day by fog, eventually got to Brooklands to demonstrate his *Pou* and gave a really delightful exhibition. Such a crowd had not been seen since last summer. The large size in ornamental lakes on the aerodrome has been drained off and levelling operations start soon. Capt. H. D. Davis, Mr. Ken Waller and party sailed on Wednesday for warmer climes.

HULL

The flying time for February was 49 hr. 40 min. The ten hours recorded on Sunday, February 9, represents a new one-day record. A dance was held on March 7, and there will be another on March 21.

CAMBRIDGE

Fifty-two hours were flown during the week ending March 7. A record for a weekday was established on Thursday, when over twelve hours' instruction was recorded. During the week four pupils took their "A" licences and five more should be forthcoming next week.

WITNEY AND OXFORD

Solo flying was handicapped by bad weather, but dual and solo times totalled fifteen hours. Miss J. A. Stanton-Nadin, Mr. D. Biggart and Mr. J. T. Binkley have become members. Mr. Jack Brain made his first solo and Messrs. T. E. Worsley and D. G. Henderson renewed their "A" licences. Miss Stanton-Nadin is taking the parachute course and hopes to obtain a licence prior to joining a well-known circus.

C.A.S.C.

Five hours and five minutes dual and two hours of solo were flown by C.A.S.C. members last Sunday. Mr. R. E. Ludman has been appointed to No. 3 (Cambs) Squadron. There are, at the moment, a few vacancies for members in No. 1 (London) Squadron.

The *Pou-du-Ciel* which, as reported in *Flight* of February 27, finished up on its back while attempting to fly, was not the property of C.A.S.C. and the pilot was not a member.

COTSWOLD

Fifty-four hours twenty-five minutes flying was logged during February. Miss E. V. Webb renewed her "A" licence, and Messrs. L. G. Lane and N. T. Leech passed their "A" licence tests. The following became members: Mrs. B. W. A. Trotter and Messrs. L. P. H. Cook, G. R. Fogerty, and W. Kennedy-Jones. A cinematograph show given by Mr. Rex Walwin showed a trip to South America in the *Graf Zeppelin* and a number of local flying events.

SOUTHEND

The week before last Miss Gaskin and Messrs. Cross and Judge became pupils and members of the Club. An Aeronca came over from Hanworth. Flying time was 21 hr. 10 min.

During the week ending March 8 the flying time was 23 hr. 10 min. Miss Cynthia Gardner and Mr. Cyril Cutts passed their "A" licence tests, and Mr. F. D. Wallace went solo. Of six new members who joined, three were *ab initio* pupils. The new restaurant is now open.

YORKSHIRE

Club aircraft flew 12 hr. 50 min. during the week ending February 28 and 9 hr. 25 min. last week. Recent new members are: Mr. H. Peake, who is to be O.C. No. 609 (Bomber) Squadron shortly to be formed at Yeadon; Flt. Lt. N. C. Odbert, Adjutant of the same unit; Major J. E. D. Shaw; Mr. and Mrs. E. N. Kent-Lemon; Mr. and Mrs. A. W. Briggs; and Mr. J. R. Moore. Mrs. C. Mackenzie has rejoined. Another cinema show, this time a presentation of *With Cobham to the Cape*, will be given at the clubhouse at 7.30 p.m. on Sunday next, March 15.

SOUTH COAST

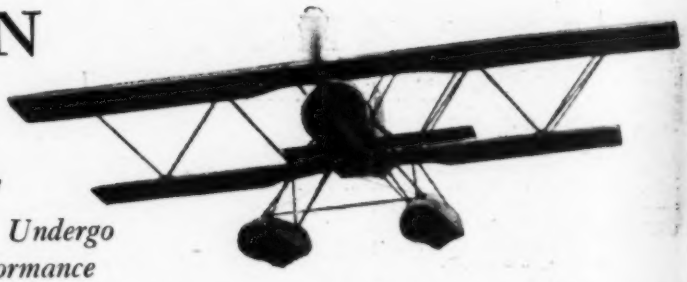
Just over twenty hours were flown by members of the South Coast Flying Club during the week ending March 7. Lord Amherst had to go to the Continent on a charter job so was unable to give his lecture on Saturday. His place was very capably taken by Mr. Golding Barratt, the control officer, who gave an excellent talk on airport control. The questions and discussion continued for nearly an hour after the talk. A landing competition has been arranged for next Sunday. The following joined the Club during the week: Mrs. Carmichael, Mrs. Grant, Miss Grant and Messrs. Grant, Granley, Galliers, Jackson and Sidnell.

A.S.T.

February's total of 1,756 hr. 35 min. was a new record. Lt. Ghovanlou, from Persia, and M. Hubaudiere, from France, completed their courses. Mr. Ten Bos, of Holland, Flt. Lt. Allison and Mr. Breeze returned to the school for training. Mr. Reddy, of India, and Mr. Soule, of Canada, also returned for navigation and seaplane training respectively. The wireless station has been re-equipped and new steel masts have been erected. The next wireless term will start on the first Monday in April and the course will then include ten hours' flying as an operator.

The seaplane training of Imperial Airways pilots continued satisfactorily and Capt. Webb, a local yachtsman, has been engaged to give practical instruction in the handling and sailing of a boat. He and three of his trainees met with an adventure on one of the first sails when, at some distance from land, they were becalmed, and were forced to spend twenty-four hours afloat with no food or drink. Work on the new landplane hangar is proceeding satisfactorily.

PROTECTION for PORTUGAL



Six Blackburn Shark Seaplanes Undergo Acceptance Trials : High Performance with Heavy and Varied Loads

WITH a whistling and growling, a strangely-marked seaplane, its lower wings decked with bombs, dropped low over the Humber, skimmed past the Blackburn works and climbed away into the distance. Someone said that " Dasher had finished his eight-eight-hundred show," which meant that Flt.-Lt. A. M. Blake had completed the trials with full bomb load and at an all-up weight, actually, of 8,750lb., of a Shark seaplane before representatives of the Portuguese Naval Air Service.

These gentlemen—Lt. Cdr. Ayres de Sousa, Lt. Cdr. Telles Pacheio and Lt. Faria by name—have been at Brough supervising the acceptance tests of half a dozen of these amazingly versatile machines, and it was in connection with these tests that one was privileged to witness a demonstration.

Blackburns secured the contract in competition with twenty-one firms. Although the Shark, as employed by our own Royal Air Force, is normally a deck-landing torpedo spotter reconnaissance type with wheel undercarriage, Portugal will use her new machines purely as seaplanes, mainly for reconnaissance and bombing. Torpedo dropping will not form part of their normal duties, although three of them have torpedo carriers. As seen at Brough, one was fitted with a long-range fuel tank beneath the fuselage (one might almost call the water-tight metal monocoque structure of the Shark a hull) and another had Marconi wireless apparatus.

With normal tankage of 171 gallons the Shark has a range, carrying reconnaissance load, of 690 miles, but with the extra " torpedo " tank in position (this holds 160 gallons) it will fly for about 1,140 miles.

Each of the Portuguese machines is fitted with an Armstrong Siddeley Tiger VIc fourteen-cylinder two-row moderately supercharged radial. This model is a special de-rated adaptation of the Tiger VI now being mounted as standard in Royal Air Force Sharks. It runs on fuel of considerably lower octane number than the Service " 87," and its compression ratio has been lowered in consequence from 6.2 to 5.35. At normal r.p.m. it delivers 700 h.p. (the Tiger VI is rated at 760 h.p.), but for take-off, at plus 2½lb. boost, 746 h.p. is available.

An observer tries the high-speed Vickers-Berthier gun on one of the Sharks

Sqn. Ldr. J. L. N. Bennett-Baggs, a director of the Blackburn Company, gave a demonstration of one of the machines equipped for reconnaissance and carrying no projectile load. The all-up weight in this case is 7,943lb. While running up the Tiger on the tarmac he fired a burst from his front synchronised Vickers gun, and on entering the water his observer " cut loose " with the compact little Vickers-Berthier on the Fairey mounting in the rear cockpit. This gun, incidentally, is a new gas-operated type with a sixty-round drum and a rate of fire of over 900 rounds a minute.

The water was as smooth as the proverbial mill pond, and quick, spectacular take-offs were not, in consequence, the order of the day. In the air, however, the machine flown by Sqn. Ldr. Bennett-Baggs behaved in a decidedly lively fashion for one of its calibre, performing really hectic dives, zooms and " shootings-up." Obviously the float undercarriage does not detract so greatly from the Shark's performance as might reasonably be supposed. Actually, the difference in speed between the torpedo bomber seaplane and torpedo bomber ship-plane versions is about 9 m.p.h.

The " Boots "

The seaplane undercarriage is of quite unusual interest. It is attached to the same fuselage and wing root joints as the wheel undercarriage, two additional attachment points being provided in the forward part of the fuselage. There is a cross strut between the floats at the front joints and wire bracing is employed only in the front truss. The floats, which incorporate shock-absorbing devices at their points of attachment, are of Blackburn design and construction, and are made of Alclad. It is possible to interchange one with the other. The water rudders are operated pneumatically by the system which actuates the wheel brakes on the landplane model. This arrangement is an invention of the Blackburn company, and not only obviates the complication of a cable control, but provides a control system which cannot affect the air rudder in the event of failure or damage.

The fitting of float undercarriage does not preclude the employment of the Shark for dive bombing, which work it will perform with its full 1,500-lb. bomb load. This, incidentally, can be made up in a number of ways. Attachments are provided for six bomb-carriers—four for bombs up to 250 lb. each and two for five-hundred-pounders. Then there are two small racks for practice bombs. The fusing controls are accessible to both pilot and observer and it is possible to release the bombs from front or rear cockpit. A course-setting bomb sight is fitted to a hinged mounting over the bombing hatch in the prone station.

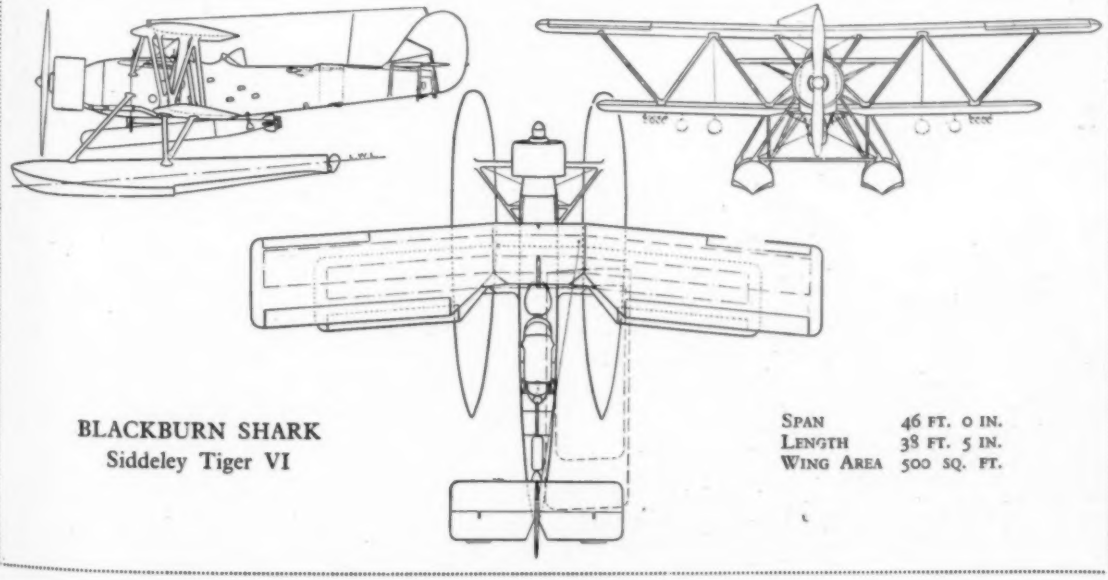
The torpedo carrier fitted to three of the Portuguese Sharks will take any normal type of torpedo up to a weight of about 1,500 lb.

Blackburn mechanics gave a demonstration of how quickly the wings can be folded. Because of the rigid bracing of the interplane struts the Shark's wings need no jury struts when folded. Folding and spreading operations require only two men and are accelerated by hydraulically

Sqn. Ldr. J. L. N. Bennett-Baggs and Flt. Lt. A. M. Blake are seen (top left and bottom right) in full seaplane-testing regalia. The top right-hand view shows one of the Portuguese Sharks with full bomb load. In the foreground of the remaining picture may be seen one with the external auxiliary tank under the fuselage.

operated latch pins which are inserted or withdrawn by a lever below the bottom wing joint.

Though the day was chilly the demonstration pilots kept warmer than the onlookers, for the Shark has a system of cockpit heating, hot air being led to the cockpit from a muff on the exhaust pipes. The adjustment of a butterfly valve inside the machine determines whether hot air shall be admitted or diverted outside the fuselage.



BLACKBURN SHARK
Siddeley Tiger VI

SPAN	46 FT. 0 IN.
LENGTH	38 FT. 5 IN.
WING AREA	500 SQ. FT.

The curious form of the wings is apparent in this view of the Dornier bomber-transport, and the auxiliary aileron-cum-flap surfaces are visible.

A PAIR of HEAVYWEIGHTS

Bomber Transport Monoplanes by Caudron-Renault and Dornier : Details of a Machine Built in Quantity for Germany's Air Force

THE British Air Ministry is testing at the moment three large bomber-transport monoplanes with a view to adopting a new standard type for the R.A.F. This fact adds interest to the following descriptions of the Caudron-Renault R.570 and the Dornier Do.23, which are two Continental types in the same category.

The Caudron-Renault machine is a twin-engined cantilever monoplane with retractable undercarriage, and is designed for use as a bomber, troop carrier, freight transport or ambulance. The crew is composed of a pilot, a navigator (who is also the second pilot and bomb aimer), and a radio operator, all of whom are grouped together in the forward portion of the fuselage.

The R.570 is of composite construction. Its central wing section and the forward portion of the cabin are built up with channel sections and covered with light alloy sheet, while chrome molybdenum steel tubes have been used for the rear portion of the fuselage. The outboard wing panels and the tail unit are of wood with stressed-skin plywood covering, and the control surfaces, of duralumin channel sections, are fabric covered.

Loading Facilities

The cabin has a circular opening measuring 4 ft. 6 in. in diameter located in the floor aft of the pilots' compartment to permit the loading of heavy pieces of freight, such as spare engines. A second opening affords simultaneous exit for four persons with parachutes. Alternatively, this door can be used for the hoisting of stretchers. There are also two lateral entrances to the fuselage. Compartments are provided for the wireless operator and navigator close behind the cockpit. The post of the bomb aimer is behind these and is fitted with glass panels in the floor. Equipped as an ambulance, the forward portion of the cabin accommodates four patients, while the rear section of the fuselage permits the installation of six stretchers in three rows. Fourteen movable seats can be installed facing forward.

The engines are eighteen-cylinder, water-cooled Renaults of the broad-arrow type, rated at 700 h.p. at 2,050 r.p.m., and giving a maximum of 830 m.p.h.

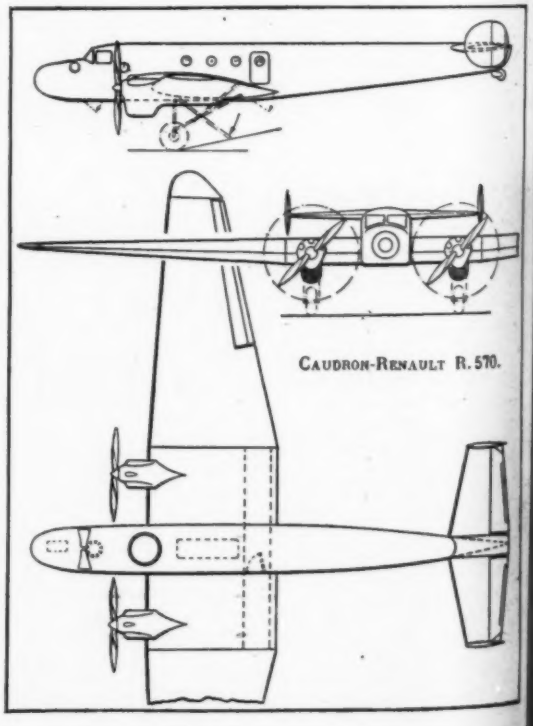
The cruising speed is estimated to be about 170 m.p.h., and the machine should land at 56 m.p.h. The maximum range against a head-wind of 32 m.p.h. is 690 miles.

The Dornier machine, which is now being extensively used by the German air force, is a high-wing semi-cantilever monoplane with twin engines and a fixed undercarriage. In plan form the wings are typical of recent Dornier practice, having curved leading edges and straight trailing edges. There is wire bracing from the fuselage to the engine mounting. Three duralumin spars, duralumin ribs and fabric covering are employed for the main wing structure. Aft of, and slightly below, the trailing edge are auxiliary surfaces which act as ailerons and, when necessary, as flaps.

The fuselage is a monocoque structure with flat sides and rounded corners. Duralumin sections are used internally, and the covering is of smooth sheet.

Two 750 h.p. B.M.W. VIu ethylene-glycol-cooled twelve-cylinder vee-type engines are normally fitted.

Empty, the Do.23 weighs 12,430 lb., and its maximum permissible weight is 29,240 lb. Its maximum speed is 161.5 m.p.h., and it cruises at 136.6 m.p.h. The landing speed is 54 m.p.h., the range 745 miles, and the ceiling about 19,000 ft.



CAUDRON-RENAULT R.570.

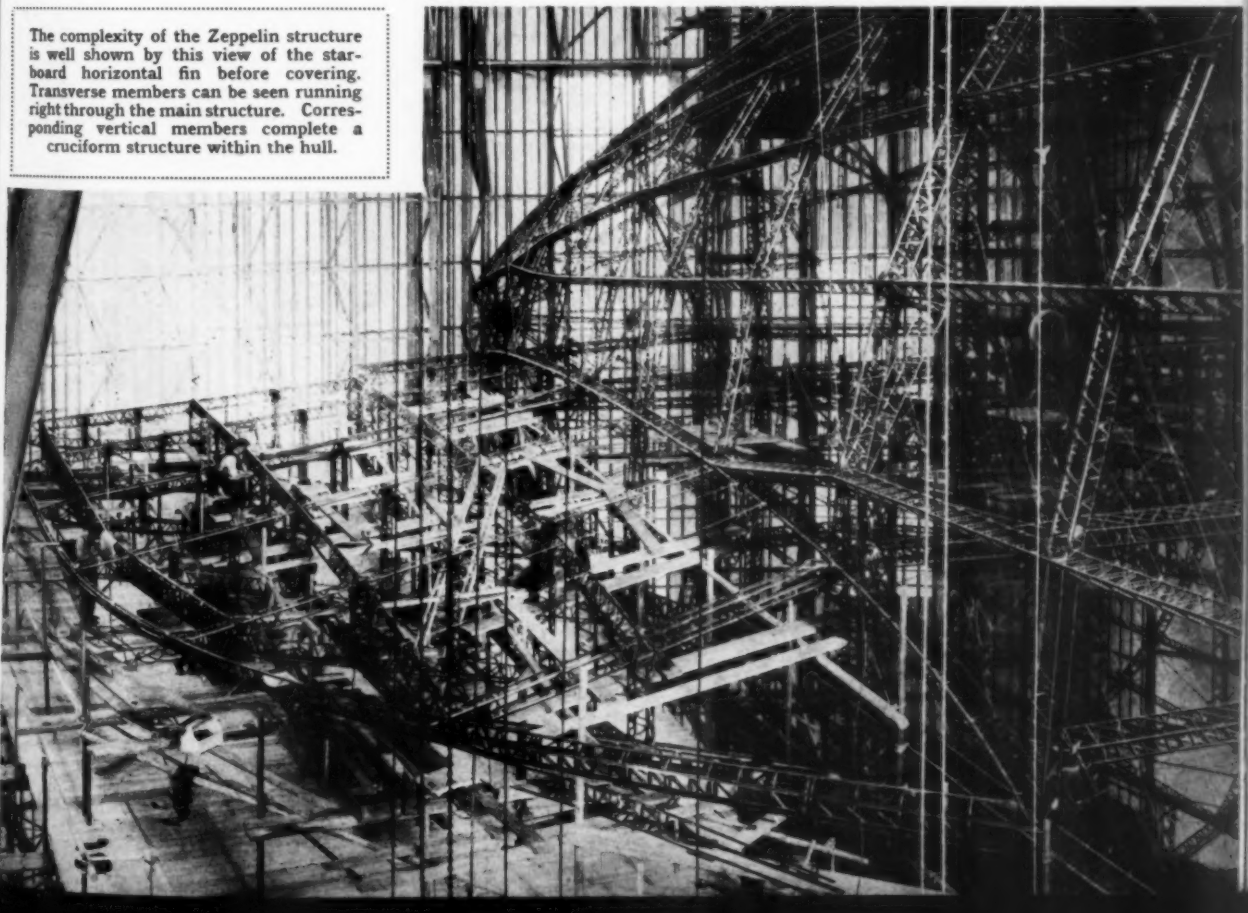
THE NEW ZEPPELIN

Part II: Some Semi-Technical Aspects: The First Test Flights: Alternative Fuel Gas System: Features of the Metal Structure

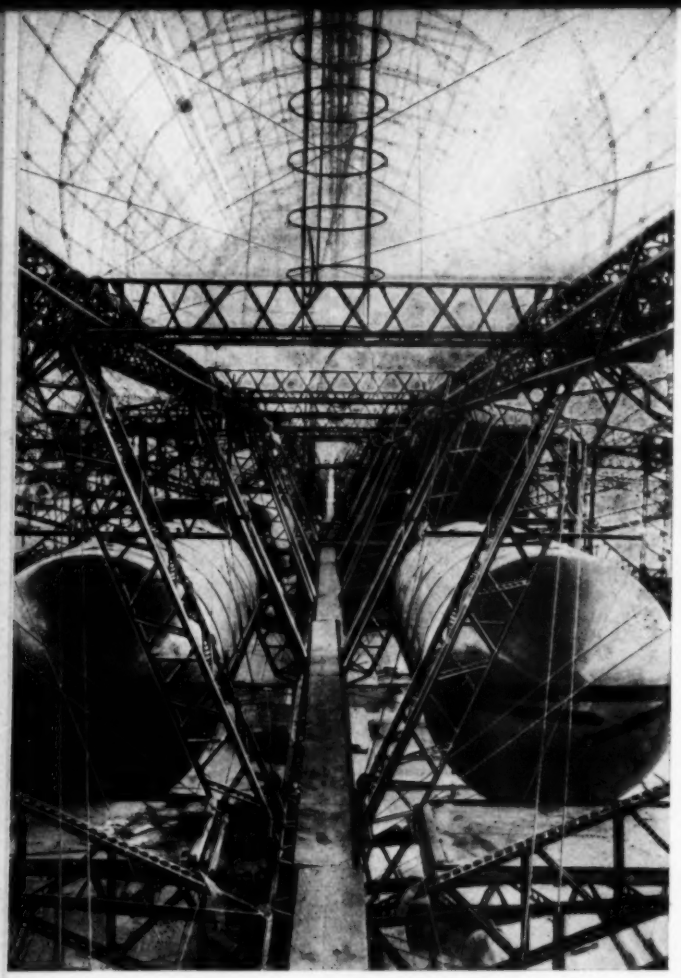
THINGS have been moving quickly at Friedrichshafen. Since the description of the new German airship was published in *Flight* last week, the L.Z.129 has made two flights, the first, of three hours' duration, on March 4, and a second, of more than eight hours, on March 5. The flights are held to have been highly satisfactory, and on March 4 all German broadcasting stations sent out a record of a running commentary of the launching and tests during the airship's first trial flight. Captain Lehmann, representing Dr. Eckener at the microphone, said the trials were more than satisfactory, having exceeded the expectations of the designers in several ways.

The only anxiety, or rather slight uncertainty, which they had, Capt. Lehmann said, related to the controllability of the airship. Although extensive tests had, of course, been made in the wind tunnel, actual full-scale flying trials were necessary before the correctness of the calculations and the confirmation of model tests were available. Capt. Lehmann expressed himself particularly pleased with the controllability of the airship. The L.Z.129 has a fineness ratio (ratio of length to diameter) of 6, which is less than that of the *Graf Zeppelin*, and it was doubtless this fact to which Capt. Lehmann was referring when he said that the only slight uncertainty related to controllability and stability. In a general way, a long and slender shape is likely to be more stable and less sensitive to the controls than a short, "fat" shape, and it would seem that Capt. Lehmann's remarks indicate in the disposition of the tail surfaces a good compromise between stability and controllability.

Other features of the new airship which were examined during the first flights were the smoothness of the Mercedes-Benz Diesel engines, their effectiveness in stopping the airship when they were reversed, and the proper functioning of the wireless equipment.



The complexity of the Zeppelin structure is well shown by this view of the starboard horizontal fin before covering. Transverse members can be seen running right through the main structure. Corresponding vertical members complete a cruciform structure within the hull.



Looking along the L.Z.129's keel cat-walk towards the stern before the gas bags were installed ; the huge structure of the ship can be seen arching overhead. Owing to its curvature in elevation, the cat-walk is even longer than the 813ft. overall length of the ship. Fuel tanks can be seen.

It cannot, of course, be claimed that the tests made so far have been exhaustive. On an airship of this size there are, as Capt. Lehmann pointed out, a thousand and one things which need looking into, but, generally speaking, it seems that the L.Z.129 promises to be a worthy successor to the famous *Graf Zeppelin*, and that from a technical point of view the airship may be expected to justify the faith of Dr. Eckener and all those associated with him. The Zeppelin company is, of course, in a unique position in that it is the only firm in the world with an unbroken record of thirty-five years of airship construction. Not only so, but the German crews have an unrivalled experience in handling airships, and the importance of this cannot easily be overrated. It is said, for instance, that one of the helmsmen of the *Graf Zeppelin* has been with the firm since the late Count Zeppelin built his first airship.

The L.Z.129 will probably make a number of flights during the next few weeks, and on March 25 it is expected that the official christening ceremony will be held, at which the airship will cease to be the L.Z.129 and will become the *Von Hindenburg*.

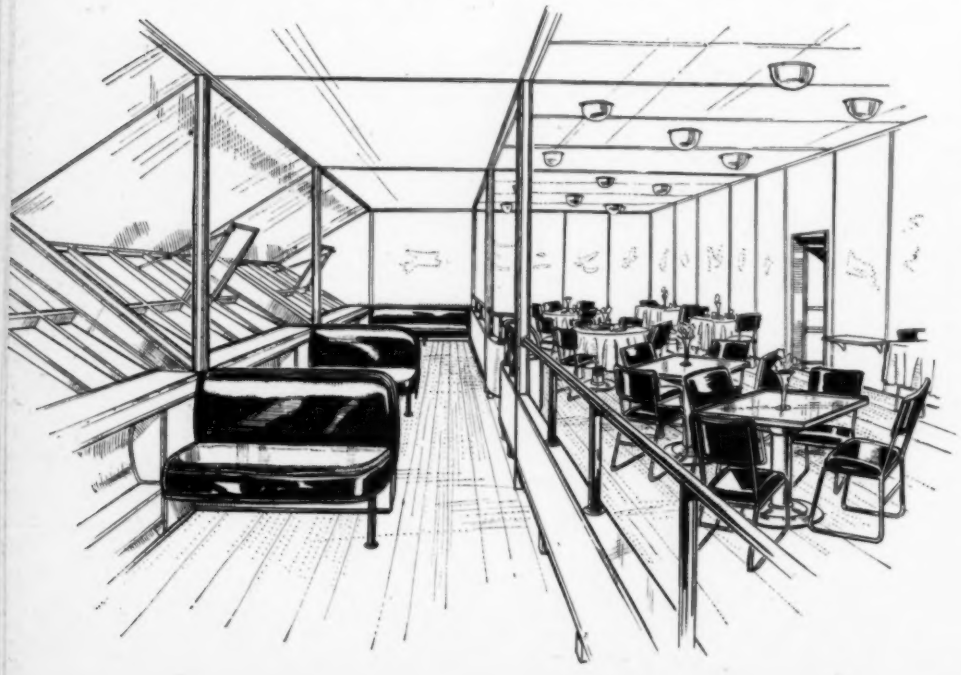
In its general type of construction, the L.Z.129 follows the practice which proved so successful in the *Graf Zeppelin*. She is, however, a very much larger airship (7,062,951 cu. ft. capacity against the 3,708,240 cu. ft. of the *Graf Zeppelin*), with four 1,100 b.h.p. Mercedes-Benz Diesel engines in place of the five 550 b.h.p. Maybach engines fitted in the *Graf Zeppelin*.

An Interesting Comparison

An interesting comparison between the two ships will be provided by the change-over from fuel gas ("*Blaugas*"), as used during part of the *Graf Zeppelin's* service, to Diesel oil. As it does not appear that the reason for using fuel gas is generally appreciated, a brief explanation may be of interest here. An airship in normal steady flight is, of course, in static balance. That is to say, her lifting gas capacity is nicely adjusted to carry the weight of the airship. Small differences between lift and weight can be cancelled aerodynamically. If the airship is "light," it can be kept at the desired altitude by depressing the elevators, thus getting a downward-acting load on top of the hull which balances the excess lift. Conversely, if she is "heavy," she can be kept up by pointing the nose upwards slightly. Obviously, there are limits to the degree of positive or negative lift thus obtainable.

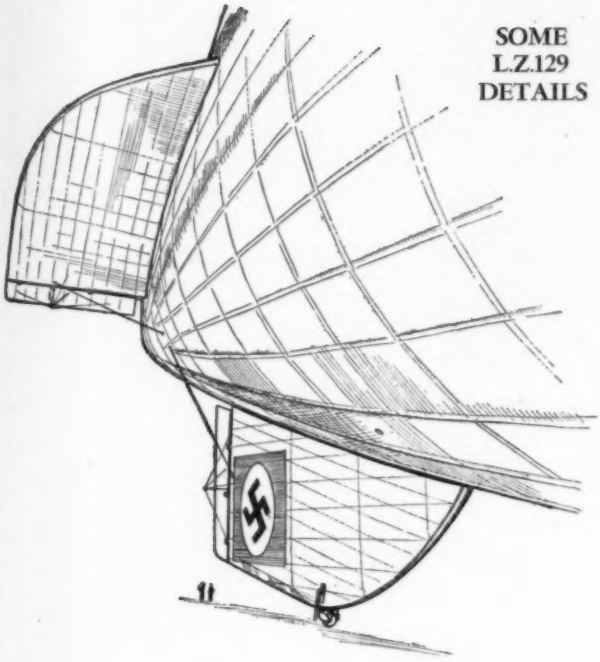
As fuel is consumed on a long flight the airship gradually gets lighter and lighter, and in order to prevent it rising it is necessary to release lifting gas, or, as it is termed in airship parlance, to "valve" gas. This, of course, is a wasteful method. "*Blaugas*" is of very nearly the same weight as air, and is burned in the engines. Consequently, the consumption of this fuel gas does not cause any material change in lift, as the air which replaces the consumed gas is of the same weight. The result is that a greater range is obtained.

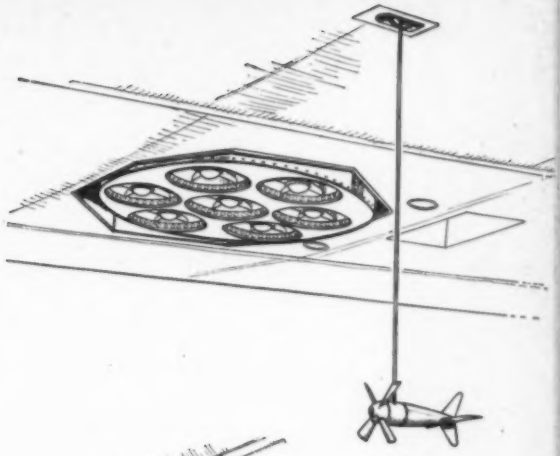
In the L.Z.129 a certain range is sacrificed by using Diesel engines burning heavy oil. The Diesel type of engine is, however, very economical in fuel consumption, a fact which goes a long way towards reducing this disadvantage. Moreover, in the design of the airship, provision has been made for the possible use later on of two lifting gases, hydrogen and helium. Should this arrangement be adopted, helium would be the main lifting gas, and a smaller quantity of hydrogen would be car-

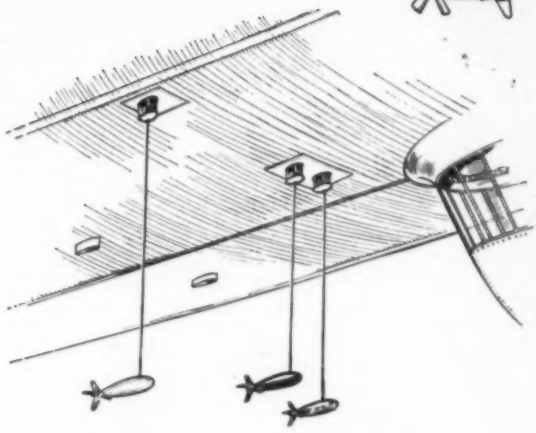


The largest room in the ship—the dining saloon and promenade. The decorative scheme is in cream and indian red.

SOME L.Z.129 DETAILS



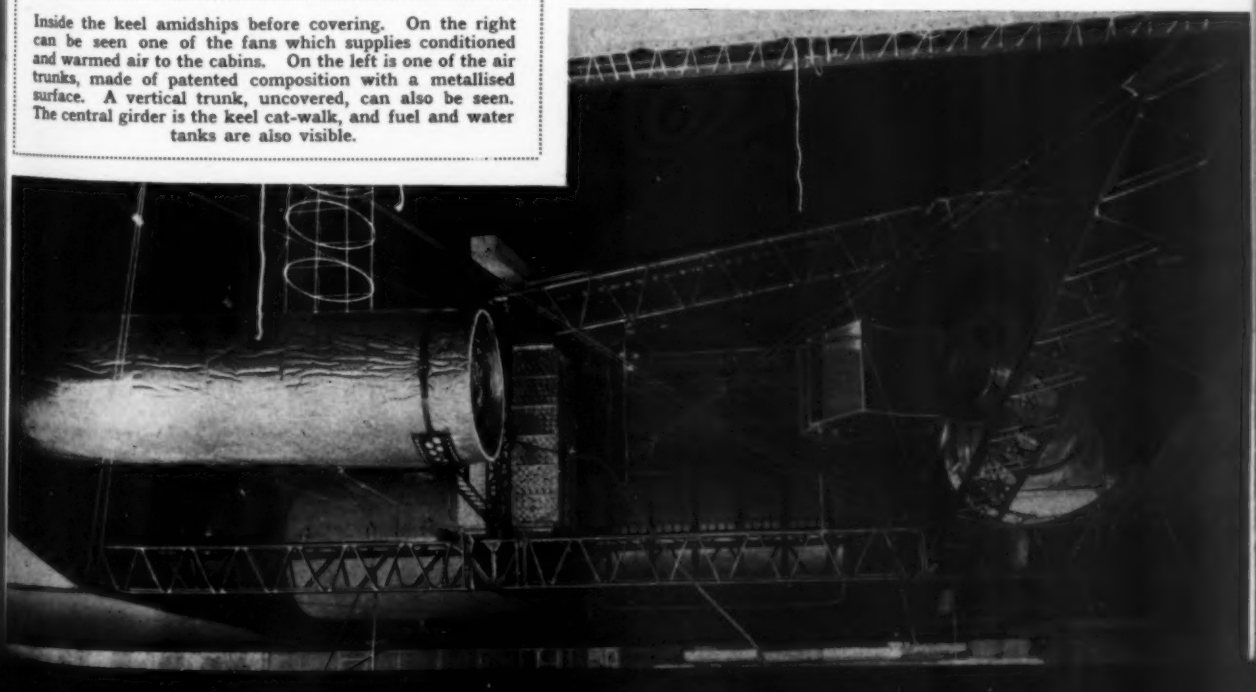




Not for economical bombing practice, but merely the streamlined weights of the three trailing aerials. (Top, left): The lower vertical fin and starboard horizontal fin. Note the swivelling tail wheel, which has a pneumatic shock-absorber; above it is a door giving access to the interior of the fin for inspection of the control mechanism. (Top, right): The 5½-million c.p. adjustable landing light amidships, and the electrical air-speed log. (Bottom, left): Three sections through the L.Z.129: at the tail unit, through the forward engine gondolas (after gondolas dotted) and through the passenger decks.

ried in smaller gas bags placed inside the helium bags and entirely surrounded by them. Two advantages would follow: The fact that the hydrogen was entirely surrounded by the inert helium gas would reduce the already very small fire risk to a minimum; as fuel was consumed, the relatively cheap hydrogen could be valved and the very expensive helium conserved. Whether or not the bi-gas arrangement is ever introduced in the L.Z.129 is likely to depend almost entirely upon the possibility of Germany arranging with the U.S. Government for the necessary supply of helium, as America is almost the only country in the world where at present helium is available in fairly large quantities and at a practicable cost. One may suppose that the close connection between the Goodyear-Zeppelin Company of America and the German Zeppelin

Inside the keel amidships before covering. On the right can be seen one of the fans which supplies conditioned and warmed air to the cabins. On the left is one of the air trunks, made of patented composition with a metallised surface. A vertical trunk, uncovered, can also be seen. The central girder is the keel cat-walk, and fuel and water tanks are also visible.



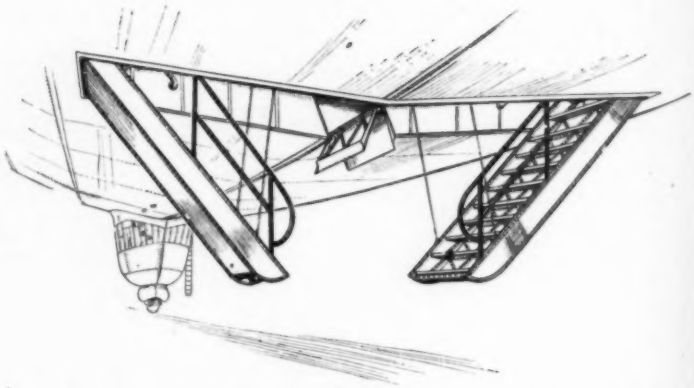
Looking along the keel cat-walk towards the nose. The central cat-walk can be seen overhead leading towards the nose. In the foreground is the cruciform internal structure for the tail fins. The gas bags, partly inflated in this photograph, are positioned by wire-meshing. Hydrogen is being used at present, but the bags may, if required, be replaced by "bi-gas" bags containing an inner bag of hydrogen surrounded by an outer one of helium.

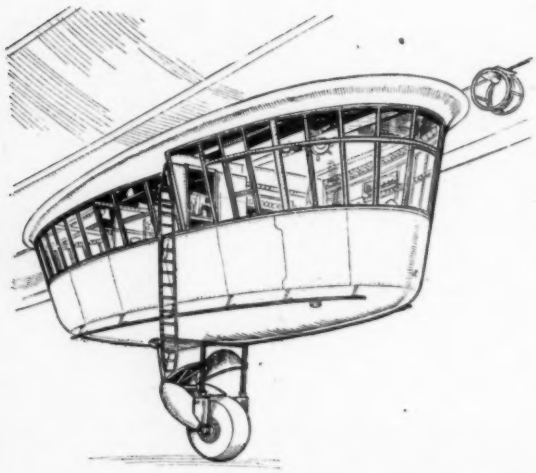
Company will go far towards making the necessary arrangements possible.

Structural features, as already mentioned, resemble those of the *Graf Zeppelin*. There are a total of forty-eight transverse ring frames, of which every third is a braced main frame, the others being auxiliary frames without wire bracing. These transverse frames carry thirty-two longitudinal girders spaced equidistant around the circumference of the ring frames. Each frame member is of the usual Zeppelin triangular section, but the corner booms are of "Omega" section, as distinct from the open-channel sections so familiar in earlier Zeppelin construction. Bracing is, as before, in the form of high tensile steel wires running diagonally in each bay formed by two ring frame sides and two longitudinal girder portions, and the ring frames themselves are braced in their own plane by similar wires.

As there is one gas bag between each pair of main ring frames, the total number of bags is sixteen. They are made of a special material developed by the Zeppelin Company; and gold-beater's skin, used in all earlier airships, is not employed. The outer covering or envelope is a cotton fabric, doped with cellulose dope. Each of the gas bags is, of course, provided with its own safety valve, and a diagram of the gas bags and their valve controls is mounted in the pilot's car, with numbering corresponding to the control handles in the car.

The heavy-oil fuel is carried in a large number of tanks arranged along both sides of the lower "cat-walk," from which they are readily accessible. A pipe line runs the entire length of the airship, and to this all the tanks are connected, as well as to the four engine units. Water ballast tanks are also arranged inside the hull at suitable points, and are provided with release valves operated from the control car to adjust the trim of the airship. A numbered diagram is used, as in the case of the gas bags, for identification of individual tanks and their connections, and indicators show at any moment the quantity in each tank, so that the captain is able to supervise the weight distribution. The usual array of pressure and temperature gauges is, of course, provided, not to mention very complete navigational and radio equipment, as well as a telephonic communication system.





(Above) : The retractable accommodation ladders are faired in by small flaps when closed. (Below) : The control car has a landing wheel with pneumatic shock-absorber. Note the D/F. loop aerial.

The tail of the L.Z.129 is of semi-cantilever construction, the internal framework running through the hull transversely and vertically to form a cruciform structure of great strength and stiffness. Each fin surface is braced by a single wire on each side. The rudders and elevators have set-back hinges, the area in front of the hinge acting as an aerodynamic balance. Normally, the control surfaces are operated by servo motors, but should these break down it is possible for the helmsman to operate the control surface direct *via* cables.

MAIN DATA OF L.Z. 129.

Length o.a.	*248 m.* (813.67 ft.)
Max. height	*44.7 m.* (146.65 ft.)
Max. diameter	*41.2 m.* (135.17 ft.)
Max. gas capacity	*200,000 cu.m* (7,062,951 cu. ft.)
Tare weight	*130 000 kg* (286,601 lb.)
Max. fuel weight	*65 000 kg.* (143,300 lb.)
50 passengers and supplies	*7 000 kg.* (15,432 lb.)
Mails and freight	*12 000 kg* (26,455 lb.)
Total payload	*19,000 kg.* (41,887 lb.)
Gross weight	*214 000 kg.* (471,788 lb.)
Total horse power	4,400 b.h.p.
Max. speed	*135 km/h* (83.9 m.p.h.)
Cruising speed	*125 km/h* (77.7 m.p.h.)
Range at cruising speed	*14 000 km* (8,700 miles)

THE AIR ESTIMATES

Number of Squadrons at Home to be Trebled by 1938 : First-line Strength Approximately 1,750 Aircraft : £164,500 More for Civil Aviation

GENERALLY speaking, the Air Estimates, 1936, which were issued last Friday,* come as something of an anti-climax after the White Paper on Defence.

Summed up briefly, they call for an increase of 13 million sterling, in round figures, and a total personnel of 50,000. As in previous years, the Air Estimates are divided into eleven financial Votes and one (Vote A) setting out the numbers of personnel.

The summarised figures are set out in the two tables published in the following pages, and, as usual, the Estimates are accompanied by a Memorandum by the Secretary of State for Air, Viscount Swinton. Extracts from the Memorandum follow.

Financial Summary.—The gross total of Air Estimates for 1935, as originally presented, was £23,851,100, a figure which included provision for the first stage of the expansion scheme approved by Parliament in the summer of 1934. In May, 1935, however, His Majesty's Government found it necessary to announce a further programme of much more extensive scope, to be put in hand forthwith and to be completed within two years. Immediate action was taken to implement this programme, and in July a Supplementary grant of £5,335,000 was voted by Parliament to provide for the extra expenditure which it was then anticipated would mature for payment before March 31st, 1936.

In the following table a comparative summary is given of the 1935 Estimates, thus revised, with those now presented for 1936.

	1936	1935 including Supplementary Estimate (H.C. 102 of 1934–5).	+ or −
	£	£	£
Gross Estimate	43,490,600	29,186,100	+14,304,500
Deduct Fleet Air Arm grant ...	3,066,000	1,873,000	+ 1,193,000
Deduct Other Appropriations-in-aid	1,424,600	1,328,100	+ 96,500
Net Estimate	39,000,000	25,985,000	+13,015,000

It has since, however, proved necessary to ask for a further Supplementary grant for 1935, primarily to meet the abnormal expenditure due to special measures taken in connection with the Italo-Abyssinian dispute, but also to provide for payments maturing as a result of the expansion scheme having made greater progress than it was safe to forecast in July. The gross total voted for 1935 has, therefore, risen from its original figure of £23,851,100 to a revised figure of £31,002,100.

Thus the gross total of the Estimates now presented for 1936 at £43,490,600 exceeds the original estimates for 1935 by £19,639,500 and the final estimate for that year by £12,488,500. The corresponding increases in the net total, at £39,000,000, are £18,350,000 and £11,404,000 respectively. These increases are necessary to finance the further stages of the expansion scheme, which is due to be substantially completed by the end of the financial year 1936. The figures would have been larger but for (*a*) the exercise of strict economy wherever efficiency will not be impaired; and (*b*) considerable allowances for the underspendings (particularly on works) which experience suggests are unavoidable with schemes of such magnitude.

Provision has been made, under the appropriate votes, for expenditure amounting to £550,000 in respect of special measures taken in connection with the Italo-Abyssinian dispute. This sum is mainly accounted for by liabilities carried over from 1935.

General Policy.—These Estimates reflect throughout the satisfactory progress which is being made, and continuance of which is anticipated in the coming year, in the execution of the expansion programme. Apart from an addition of 27 first-line aircraft to the Fleet Air Arm, the formation of new units in 1936 will be confined to increases in the Metropolitan strength of the Royal Air Force.

THE R.A.F. EXPANSION

Strength, Distribution and Organisation of the Royal Air Force.—The programme of expansion commenced last May envisaged the addition of 71 new squadrons to our Metropolitan air strength by March 31st, 1937, bringing the total strength of the Royal Air Force at home up to 123 squadrons. Formation of these squadrons, coupled with increases in the establishment of certain existing squadrons, was originally designed to produce a total first-line strength at home of some 1,500 aircraft. The present Estimates provide for the substantial completion of this programme. These plans have, however, recently been recast as described in Cmd. 5107. The changes now contemplated in the composition of certain squadrons will provide a substantial accession of first-line strength, and will, in other directions, greatly enhance alike the defensive and offensive power of the Home Defence Force. In addition, four new auxiliary squadrons are to be formed and the five regular squadrons at present allotted for Army Co-operation are to be reorganised to provide seven squadrons. These changes and additions will, of course, entail the entering and training of additional personnel and the ordering of a further substantial number of aircraft, engines and their accessories. Action is already in train under all these heads, but execution of the revised programme, including provision of full war reserves, will extend into 1937 and 1938. The increased first-line establishment which will result from these measures will provide a total of 129 squadrons at home (of which 20 will be non-regular) with a strength in first-line aircraft of approximately 1,750. These figures, which are in all cases exclusive of the Fleet Air Arm, compare with 53 squadrons with 580 first-line aircraft on April 1st, 1935.

The existing 25 squadrons overseas will be maintained during

* H.M. Stationery Office, price 3s. 6d. net.

STATEMENT of AIR EXPENDITURE, 1928 to 1934 and of AIR ESTIMATES, 1935 and 1936.

Financial Year.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935. (Estimate, including Supplementary Estimate.)	1936. (Estimate.)
Vote A.—Numbers	(a) 28,888	(a) 29,240	(a) 29,988	(a) 30,263	(a) 29,520	(a) 28,470	(a) 28,780	(b) 45,000	(b) 50,000
	£	£	£	£	£	£	£	£	£
Vote 1.—Pay, etc., of the Royal Air Force	3,530,219	3,550,413	3,710,948	3,836,741	3,866,857	4,020,086	4,227,300	5,002,000	6,518,000
" 2.—Quartering, Stores (except Technical), Supplies and Transportation	1,651,116	1,670,589	1,697,433	1,525,545	1,470,787	1,399,492	1,456,139	2,044,000	2,838,000
" 3.—Technical and Warlike Stores (including Experimental and Research Services) ...	6,402,616	6,968,333	7,681,057	7,846,336	7,352,003	6,952,856	7,190,291	11,152,000	18,491,000
" 4.—Works, Buildings and Lands	1,756,005	1,852,543	1,606,732	1,724,928	1,523,535	1,389,938	1,819,858	4,092,500	6,600,000
" 5.—Medical Services	292,060	279,921	290,715	294,153	286,198	278,483	295,333	316,000	368,000
" 6.—Technical Training and Educational Services	505,789	475,251	486,069	474,596	418,521	388,407	380,252	488,000	657,000
" 7.—Auxiliary and Reserve Forces	533,863	578,842	587,751	591,011	521,982	463,791	405,656	527,000	557,000
" 8.—Civil Aviation	353,764	408,984	439,985	465,767	462,305	460,086	509,130	595,500	760,000
" 9.—Meteorological and Miscellaneous Effective Services	219,494	221,466	227,519	229,909	223,122	326,197	328,080	546,000	817,000
" 10.—Air Ministry	650,738	657,938	664,799	638,321	637,556	643,482	690,809	832,000	950,000
" 11.—Half-Pay, Pensions and other Non-Effective Services	194,506	213,900	235,046	240,492	294,255	377,574	367,494	390,000	444,000
Balances Irrecoverable and Claims Abandoned	1,765	2,384	3,719	1,149	250	402	551	—	—
NET CASH EXPENDITURE	16,091,935	16,880,564	17,631,673	17,868,948	17,057,371	16,700,794	17,670,893	25,985,000 (c)	39,000,000

NOTE.—The figures for expenditure represent the net expenditure after taking into account receipts noted in the Appropriation Account as receipts in excess of estimated appropriations-in-aid.

(a) Average number borne. (b) Maximum number to be borne. (c) Excludes further Supplementary Estimate for £1,611,000. (H.C. 41 of 1935-36.)

1936 at a first-line strength of approximately 270 first-line aircraft, though, as stated in Cmd. 5107, the formation by 1939 of a further 12 squadrons for service overseas has been approved.

As above stated, the Fleet Air Arm is to be increased during the year by 27 first-line aircraft. Proposals are also under consideration for a reorganisation of catapult units. On this basis the Fleet Air Arm will attain a strength approximately equivalent to 21 squadrons with a first-line strength of 217 aircraft by the end of the current year. As explained in Cmd. 5107 there will be further substantial increases in the Fleet Air Arm in 1937 and subsequent years.

The Government of the Straits Settlements have lately approved the formation of a small Volunteer Air Force for co-operation with the fixed defences of the Singapore Base. A contingent of officers and men of the Royal Air Force will be attached to the new unit for instructional purposes and to assist in its technical maintenance.

Vote A (numbers) stood at a total of 33,000 officers and men in the original estimates for 1935. This figure was raised to 45,000 in the Supplementary Estimate of July last. It is now necessary to make provision for a total of 50,000, which compares with a corresponding figure of 31,000 two years ago. This figure is exclusive of officers and men serving on the Indian establishment.

The next paragraphs in the Memorandum deal with operational activities of the Royal Air Force and other events overseas during the past year. Among the activities reviewed are frontier patrol work in Africa since the outbreak of the Italo-Abyssinian war, army co-operation on the North-West Frontier of India, preparedness for action following warnings to tribes in the Aden Protectorate, and good work at the time of the Quetta earthquake. Survey flights, long-distance flights and special exercises are also reviewed, and the section ends with a note on the Royal review of the R.A.F.

PERSONNEL AND TRAINING

The succeeding sections deal with (a) personnel and training, and (b) technical equipment. Since they form a concise summary of the steps taken under the expansion scheme, we quote them at length:—

Personnel and Training.—Vote 1 (Pay, etc., of the Royal Air Force), at £6,518,000 net, shows a rise of £1,516,000 on the current year's provision, as increased by the July Supplementary Estimate.

The enlarged and greatly accelerated expansion announced in May last involved the entry of very large numbers of officers and airmen, and a total of some 2,500 pilots and over 22,000 airmen (mostly for skilled trades) has now to be trained in less than two years.

Whilst the permanent entries through the Royal Air Force College, Cranwell, and from the Universities are being increased, the bulk of the new requirements in pilots are being met by officers entered on short service commissions and by a new class of airman pilot entered direct from civil life for four years' service on the active list followed by six years in the reserve. To secure the very large number of airmen required, the London Recruiting Depot was enlarged and ten supplementary depots were opened in England, Scotland, Wales and Northern Ireland.

The new scheme for the training of pilots referred to when the Estimates for 1935 were presented, under which the initial flying training is given at civil schools, has been successfully put into force, and has enabled the much larger number of pilots required by the expansion to be provided according to programme. Thirteen civil training schools in all are now operating, nine of these having been formed since June, 1935. Training at these schools has been carried out on a progressive scheme and the pupils who have received preliminary instruction at them are successfully continuing their training at service Flying Training Schools. To cope with the more advanced stages of training, it has been necessary to form five additional service schools, bringing the total number of these latter up to eleven.

A similar expansion in training facilities has been necessary to meet the essential demands of armament training, and arrangements have been completed which will bring the number of Armament Training Camps up to five. Four more such Camps are required, and further sites for these are under investigation.

As the Royal Air Force Depot at Uxbridge was not adequate to deal with the preliminary disciplinary training of the large body of newly entered airmen, a subsidiary depot was opened at Orpington. At the same time the schools at Halton, Cranwell and Manston have been enlarged to meet the greatly expanded needs of technical training and a new school for the same purpose has been instituted at Henlow.

Auxiliary and Reserve Forces.—The net total of Vote 7 (Auxiliary and Reserve Forces) is £557,000, as compared with £527,000 for 1935.

The system, introduced in 1934, under which candidates from civil life are entered direct into the Reserve for training as airman pilots was successfully continued in 1935. A further substantial increase in the strength of the pilot reserve will take place in 1936 and the system of training will be adapted to bring the Reserve within the reach of candidates who are unable to devote any long continuous period to flying training.

New Auxiliary Air Force squadrons have been formed in the West Riding of Yorkshire, Cheshire and West Lancashire, and steps are being taken to convert existing Cadre (Special Reserve) squadrons into Auxiliary Air Force squadrons. This will have the advantage of bringing all non-regular squadrons into one organisation on a common model.

As foreshadowed in the Memorandum which accompanied Air Estimates, 1935, an Air Squadron has been formed at the University of London.

Technical Equipment.—The net total of Vote 3 (Technical and Warlike Stores) is £18,491,000; the total for 1935 was £11,152,000—including the Supplementary grant of £3,150,000 voted in July. There is thus the substantial increase of £7,339,000 on the 1935 provision and this Vote now represents over 47 per cent. of the net total of Air Estimates.

The re-arming programme covers eleven squadrons, including one

ABSTRACT of AIR ESTIMATES, 1936.

Votes.	Subject.	Estimates, 1936. Gross Estimate.	Appropriations in Aid.	Net Estimate.	Estimates, 1935. Including Supplementary Estimate (b). Gross Estimate.	Appropriations in Aid.	Net Estimate.	Differences on Net Estimates. Increase.	Decrease.	Votes.
A	I.—NUMBERS: Maximum Number of Officers, Cadets and Airmen to be borne on the Establishment of the Royal Air Force, exclusive of India...	—	—	Total Numbers. 50,000	—	—	Total Numbers. 45,000	Numbers. 5,000	Numbers. —	A
	II.—EFFECTIVE SERVICES:	£	£	£	£	£	£	£	£	
1	Pay, etc., of the Royal Air Force	7,168,000	650,000	6,518,000	5,611,000	609,000	5,002,000	1,516,000	—	1
2	Quartering, Stores (except Technical), Supplies and Transportation	2,975,000	137,000	2,838,000	2,148,000	104,000	2,044,000	794,000	—	2
3	Technical and Warlike Stores (including Experimental and Research Services) ...	21,779,000	3,288,000	18,491,000	13,201,000	2,049,000	11,152,000	7,339,000	—	3
4	Works, Buildings and Lands	6,748,000	148,000	6,600,000	4,275,500	183,000	4,092,500	2,507,500	—	4
5	Medical Services	391,000	23,000	368 000	333,000	17,000	316,000	52,000	—	5
6	Technical Training and Educational Services ...	671,000	14,000	657,000	501,000	13,000	488,000	169,000	—	6
7	Auxiliary and Reserve Forces	557,100	100	557,000	527,100	100	527,000	30,000	—	7
8	Civil Aviation	908,000	148,000	760,000	748,500	153,000	595,500	164,500	—	8
9	Meteorological and Miscellaneous Effective Services...	(a) 849,000	32,000	817,000	574,000	28,000	546,000	271,000	—	9
10	Air Ministry	960,000	10,000	950,000	837,500	5,500	832,000	118,000	—	10
	Total Effective Services ... £	43,006,100	4,450,100	38,556,000	28,756,600	3,161,600	25,595,000	12,961,000	—	
	III.—NON-EFFECTIVE SERVICES:									
11	Half-Pay, Pensions and other Non-Effective Services...	(a) 484,500	40,500	444,000	429,500	39,500	390,000	54,000	—	11
	Total Effective and Non-Effective Services ... ... £	**43,490,600**	**4,490,600**	**39,000,000**	29,186,100	3,201,100	25,985,000	13,015,000 (b)	—	

Net Increase, **£13,015,000**

(a) Certain non-effective charges in respect of staff for Meteorological Services are provided under Vote 9.

(b) Total, Original Net Estimate, 1935 ... ... £20,650,000
Add—Supplementary Estimate (H.C. 102 of 1934–35) ... 5,335,000
Excludes further Supplementary Estimate for £1,611,000 25,985,000

squadron in India and the equivalent of seven squadrons of the Fleet Air Arm. The cost of the two latter items is, however, recovered in Appropriations-in-aid, and the large increase in the grant from the Admiralty under Subhead P.1 also reflects the additions contemplated during the year to the first-line strength of the Fleet Air Arm.

Research and Technical Development form the next section, in which it is stated that the provision for experimental services in the various Votes (abstracted in Appendix I to the Estimates) amounts to £2,007,000. This represents an effective increase of approximately £402,000 on the figure of 1935; the balance of the apparent increase is due to a change of classification. This section goes on to review the acceleration of the experimental programme during the past year.

The Secretary of State for Air next deals with the net total of Vote 4 (Works, Buildings and Lands), of £6,600,000. He points out that the increase of £2,507,500 over the provision voted by Parliament for 1935 is due directly to the capital expenditure on land and buildings necessitated by the expansion. Of the new sites needed at home, twenty-nine have already been acquired, or are in process of acquisition. In addition, four sites have been acquired for new stations overseas.

CIVIL AVIATION SUBSIDIES

The next section deals with civil aviation subsidies, and contains facts which warrant quotation in full:—

Civil Aviation.—Vote 8 (Civil Aviation) for 1936 shows the substantial rise of nearly 28 per cent. on the corresponding figure for 1935, the gross total being £908,000 and the net £760,000. This increase is due to a series of far-reaching developments in British air transport throughout the world which are already in progress or in prospect.

In preparation for the inauguration of the Empire Air Transport Scheme, additional provision is required for improving the ground facilities along existing air routes, so as to permit of a speeding-up of services, and for organising the modified routes to be followed by the flying boats by which the new scheme will be mainly operated. A total of £204,000 has been included for this purpose.

The possibility of the establishment of an air service across the North Atlantic has been under close investigation by the Air Ministry for a long time past. As the result of a provisional agreement reached at Ottawa in December last between representatives of the United Kingdom, Canada, Irish Free State and Newfoundland, and of subsequent discussions with the United States' authorities, arrangements are being made for experimental flights to be undertaken by Imperial Airways, Ltd., next summer with a view to the organisation of a regular service across the North Atlantic as soon as possible. In addition to the direct route via Ireland to Newfoundland, it is hoped that arrangements can be made to use the alternative route via the Azores and Bermuda. A sum of £20,000 has been included for payments to Imperial Airways, Ltd., in respect of these experimental flights and £75,000 has been provided to meet any contributions which may be necessary from Air Votes during 1936 towards the cost of constructing the requisite flying boat and landplane bases.

Subsidy payments to Imperial Airways, Ltd., in respect of their European services (£65,000) and their England-India service (£105,000) are lower by £15,000 and £35,000 respectively, under the terms of the agreements with the Company. The present agreement in respect of the Egypt-South Africa service expires on 23rd January, 1937, and provision has been made to bridge the interval between that date and the end of the financial year.

The air base in Bermuda should be ready during the summer, which will allow of the opening of the projected air service between Bermuda and New York by Imperial Airways, Ltd., and Pan-American Airways in co-operation. The annual subsidy to Imperial Airways, Ltd., for this service will be £18,000, one-fifth of which will be provided by the Government of Bermuda; £9,000 has been allowed in the present Estimates on account of this subsidy.

NEW EMPIRE ROUTES

Arrangements have been made with Imperial Airways, Ltd., for the operation of an air service, once weekly in each direction, between Khartoum and West Africa, connecting at the former place with the Company's main service between England and South Africa. An interim service on the section between Khartoum and Kano commenced on 3rd February, and an extension to Lagos, and later to Accra and Takoradi, will follow as soon as the necessary ground organisation can be provided by the local governments concerned. A sum of £25,000 has been included in the Estimates for subsidy in respect of this link service. Its cost will be borne on Air Votes until the inauguration of the Empire Air Transport Scheme, to the cost of which Nigeria and the Gold Coast will contribute.

A number of experimental flights between Penang and Hong Kong has been successfully carried out by Imperial Airways, Ltd., since October, 1935, and it is proposed to open a regular commercial air service to Hong Kong by this route as soon as the necessary authorisation of the French Government has been received for operation over French Indo-China. The service will connect at Penang with the main Empire air route and will provide Hong Kong with an air connection to the through service between England and Australia. Provision has been made for the necessary subsidy, and the Government of Hong Kong are being invited to make a contribution towards the cost of the service.

A sum of £20,000 has been provided for the operation of regular services to Scandinavia—a day service for passengers and mails, and a night service for mails only. It is intended to entrust operation of these services, which will commence in June next, to British Airways, Ltd., and a White Paper containing detailed proposals will be laid before Parliament at an early date. Meantime the Company is carrying out a series of flights on an experimental basis.

The increase of internal air services in the United Kingdom during 1935 has rendered it necessary to consider what steps should be taken in order to facilitate and safeguard civil flying under the difficult weather conditions frequently experienced in this country.

The projected Air Survey of Great Britain, which had originally been set in hand by the Aerodromes Advisory Board, was taken over during 1935 by the Air Ministry and is now virtually complete. Much valuable work on this Survey had been done by the Advisory Board, but it had become evident to them, on a review of the whole field, that the work was no longer appropriate to a voluntary body, but could more effectively be undertaken by a Department of State. Transfer of the work to the Air Ministry was accordingly arranged and the Board put all their records and results at the service of the department. Acknowledgment is due to the Board for their pioneer work. A special organisation was set up within the Air Ministry to carry on the survey and its results are being taken up by a committee, representative of the Departments principally concerned, which was appointed in July, under the chairmanship of Sir Henry Maybury, to consider and report upon measures for the development of civil aviation in the United Kingdom.

The number of light aeroplane clubs assisted under the subsidy scheme has increased to 41 and £25,000 has been taken in the present Estimates for grants to them. £5,000 has again been included for assistance to the Gliding Movement.

A Bill has been introduced seeking Parliamentary authority for a series of proposals of great importance to the future development of civil aviation in this country. The Bill is also designed to enable the department to carry out the main recommendations of the Committee under the chairmanship of Lord Gorell, which reported in 1934, including those (i) for devolution of the control of airworthiness of civil aircraft and (ii) for the compulsory insurance of aircraft against third-party risks.

METEOROLOGICAL AND AIR MINISTRY VOTES

Meteorology.—The net provision made for the Meteorological Service is £180,000, representing an increase of £25,000 over the figure for 1935

The development of British air transport both at home and abroad, and the expansion of the Royal Air Force, are reflected in this increased provision, the bulk of which arises on the subheads for salaries. Provision is made for staff for further investigation of the weather conditions over the North Atlantic Ocean in connection with the projected Trans-Atlantic air service, and also at a number of new meteorological stations.

The staff of the Meteorological Office is in course of reorganisation as a result of the recommendations of the Committee on the Staffs of Government Scientific Establishments.

The subhead for supply of Instruments and Equipment shows an increase of £6,000. Of this sum £2,000 is for purchase of instruments required by the Navy and will ultimately be recovered from Navy Votes. The remainder of the increase is to provide the equipment required for the new stations already referred to.

Finally, the Memorandum enlarges on Vote 10 (Air Ministry) which, at a net total of £950,000, shows an increase of £118,000 over the provision for 1935. It explains how the expansion scheme and the development of civil aviation have thrown a heavy strain on the Ministry, and goes on to deal with the work entailed by the wider problems of production and industrial organisation. In this, states the Memorandum, ... the Department has the great benefit of the advice of Lord Weir. Special mention may also be made of two important new functions for which additional staff has had to be provided, viz. (i) the co-ordination and hastening of the greatly increased output of aircraft engines, and their accessories, now urgently required; and (ii) the control by technical and other costings of prices for all kinds of aeronautical material. Among the measures taken to promote the first of these two objectives, a number of specially qualified officers and engineers of standing from civil life have been appointed to the department of the Air Member for Supply and Organisation. The second, control of prices, is being dealt with by an augmented staff of technical costs officers and cost accountants in the Contracts Directorate. Further, on the major issues arising in this latter field, the Department has the assistance of the Advisory Committee under the Chairmanship of Sir Hardman Lever, and has also secured the services of certain other men of eminence in the commercial world who have most public-spiritedly volunteered their help.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

INEXPLICABLE ACCIDENTS.

I WAS interested in your remarks in the February 27 issue of *Flight* relating to the crash at Cranwell, and I thought that you might be interested to hear of an incident which occurred at a flying club about eighteen months ago.

A new member joined the club and expressed his intention of taking an "A" licence. He had no previous flying experience.

During the morning he went up with the instructor and had half an hour's dual instruction in a perfectly normal manner. In the afternoon he thought that he would do some more, but, after flying around for a few minutes, he suddenly and for no apparent reason put the machine into a dive.

The instructor immediately tried to check this, but the harder he pulled back on the stick the harder the pupil pushed forward on it; the instructor then tried to close the throttle, but the pupil forced it open against him, and so he switched the engine off.

The machine was, of course, rapidly losing height, and in spite of all his efforts the instructor was overpowered by the pupil and was unable to prevent the machine from being flown into the ground at about 80 m.p.h.

The undercarriage broke and the machine turned over, but luckily neither of the occupants was seriously injured, although the machine was a "write-off."

The pupil, who was rendered unconscious in the crash, was later quite unable to account for the occurrence, and was, in fact, unable to remember anything about it, as is not uncommon in cases of concussion.

In view of the fact that a crash like this, which might very easily have proved fatal, and therefore apparently unaccountable, actually occurred with an instructor of over 8,000 hours' experience, it might be a possible explanation of the Cranwell crash. [Actually, it is unlikely that the passenger involved in the Cranwell accident was a pupil, as his rank was that of Aircraftman.—ED.]

Further, although this sort of thing must be exceptional (God forbid that it should become commonplace) it would rather seem to suggest the desirability of providing in instructional machines a means of disconnecting the pupil's controls, as has been done in the past in certain machines. [*Flight* has more than once advocated this in the past.—ED.]

Hove, Sussex. D. W. BROWN.

INSTRUMENTAL SHORTCOMINGS.

MAY I venture, through the medium of your much-read and respected paper, to bring to the notice of manufacturers of commercial aircraft to-day, in this country, the point of view of the operator in relation to manufacturers' specifications? I write more of the instrument specification than of anything else.

I think that I am right in saying that there is no civil type of air liner or feeder-line machine produced to-day in this country which, in its standard form, would be of any use to any serious operating company. Practically all would require a completely rearranged instrument layout, and all would need extra instruments.

Recently a well-known firm produced a new aircraft. When I saw this type for the first time I found that the layout of the instruments was bad, and, in any case, those provided were not even sufficient, from the safety point of view, for the private owner. Now my delivery date is postponed.

Surely, would it not be wiser, instead of all this secrecy stunt, to circularise operators and find out what the technical staffs of the various companies require as a minimum? The general requirements must be similar in principle. After all, it is the operator who has to fly the aeroplane in the end; so why hide everything from him until the last minute and then let him find that it is not as required?

The manufacturer need not be ashamed of not knowing what the operator wants. The operator is the ONLY PERSON who *can* know this, and the best way of selling anything is to find out what the buyer wants *first*—ask Henry Ford.

Croydon OPERATOR.

PARACHUTES FOR THE PROLETARIAT

I BENEFIT often by "Indicator's" weekly comments. Respecting his recent remarks on aerobatics, it amused me at Hatfield (whither I repaired last summer for a diet of Tiger Moth) to note that R.A.F. youngsters use slots and parachutes, but civilians mostly slotless Tigers, disdaining parachutes. ["Disdaining" is hardly the word; as "Indicator" said plenty of people would use these at present rather expensive luxuries if they were available.—ED.]

This subject of parachutes interests me, as I do much of my flying in Switzerland. I have never had trouble out here, save once (a faulty plug at 14,000ft.) with Moths in the mountains, but, of course, if anything serious occurs to one's engine in the high Alps the risk is often extreme.

It is thus obvious that the safe single-engined machine for general use (which should include mountains) does not exist, though the excellence of the Gipsy engine is almost a guarantee. I would suggest that what is wanted is a two-seater with (a) two small engines, such as the Cirrus Minor (one engine might not keep the machine sufficiently high, *i.e.*, over the clouds at 14,000ft., but it would help out the glide to lower regions when these are not excluded by a dense sea of cloud); (b) landing speed and "pancaking" characteristics such as those of the B.A. Swallow. For Alpine work all should be subordinated to these essentials. A ceiling of 17,000ft. suffices amply.

To return to aerobatics: I agree with "Indicator" as to flick rolls. This evolution is much easier to learn than the slow roll, but it is forbidden on Moths at Hatfield, doubtless wisely. Another most questionable amusement is the loop that follows a bunt. I have never done this, but a Swiss friend describes the strain on his body, as well as on the machine, as too great.

One does not require, however, to carry out all the catalogued stunts—only those which enable one to perfect the mastery of one's machine in all positions it may take up. I have done most, preferring slow rolls, loops and the varieties of stalled turns (and, of course, slips and spins) for purposes of amusement. By the way, one young friend of mine (I am nearly seventy myself) has had an airlock six times when stunting, recovering even firing, however, by moving the throttle forward and back. At Heston last autumn in a Staggered Avro, after a loop followed by a "wing-over," my engine spluttered and nose dropped, so I had to make for the (rather) distant aerodrome, recovering even firing at the boundary by throttle handling when I had some 40ft. in hand. This seems to suggest that one's aerobatics are best done decently near a good landing place. DOUGLAS FAWCETT.

Sierre, Switzerland.

POSTCARDS FROM THE CLOUDS

Early British Balloon Posts, by John Pringle, M.D. Privately printed and published at 7s. 6d.

APPEALING primarily to the air mail collector, this book also contains plenty to interest all those who find romance in the story of the free balloon.

In 1901-1902 picture postcards were a novelty, and there was a national craze for collecting them and exchanging with friends. Nothing was more natural than that their value should be enhanced by sending them on an aerial voyage before delivery. Thus these "balloon posts" were organised, and thousands paid sixpence apiece for stamped commemorative postcards, which were then collected, taken aloft, and dropped overboard in batches in various parts of the country (or even, in the case of one trip, on the Continent). A surprising number were picked up and conscientiously forwarded to the addressees.

The story of the Continental flight, which formed an attempt on the existing long-distance record of 1,193 miles, makes absorbing reading. Starting from the Crystal Palace the balloon, carrying M. Gaudron (pilot), Mr. J. L. Tannar (owner) and Major C. C. Turner, of the *Daily Telegraph*, made a forced and eventful landing in Sweden, though not before breaking the record for a flight over water.

Dr. Pringle's book concludes with a chapter on the patient and plucky efforts of Dr. F. A. Barton, in 1902-1904, to secure a £4,000 War Office order for the airship which he had built at the Alexandra Palace. Incidentally, the gas-main valve used for filling it may still be seen in the grounds.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS · AIR MINISTRY ANNOUNCEMENTS

TEMPORARY ARMAMENT TRAINING CAMP

A temporary armament training camp for one squadron formed at Aldergrove on March 2, 1936. The range is on Lough Neagh.

SPECIALIST ARMAMENT COURSE

The undermentioned officers, having successfully completed the specialist armament course at the Air Armament School, Eastchurch, which terminated on December 20, 1935, are granted the symbol "A":—Sqn. Ldrs. C. E. V. Porter, S. F. Vincent, A.F.C., F/O.s W. J. F. Bull, C. H. B. Bullock, E. S. Butler, R. H. E. Emson, A. H. Fear, A. W. Geoghegan, L. C. Slee, M. F. D. Williams.

The undermentioned officer of the Royal Canadian Air Force has also successfully completed the course:—Flt. Lt. C. R. Dunlap.

TRANSFER OF OFFICERS TO THE RESERVE

The undermentioned short service and medium service officers should note that they become due for transfer to the reserve, or (where indicated) for relinquishment of commission, on completing their period of service on the active list:—

AUGUST-SEPTEMBER, 1936

General Duties Branch

Flt. Lts. *Rowland Baron Harrison, Thomas Harold Downes, William Frank Lovering, Morgan Griffiths, Vernon Dillon Morshead, Ernest Leslie Jack Rowe, Douglas John Harrison.

F/O.s *Bernard Adolf Casey, *William Herbert Husbands, *John Joseph Murphy, *Clifford George Skinner, *Clarence Herbert Smith, *Kenneth Reid Warton, ‡Hubert Fowler Boss-Walker, Alban Majendie Carey, †Jack Goodhart, John Harvey Heyworth, Herbert Langdale Andrews, Peter Fidelis Foss, Montgomery Vincent Gibbon, Peter Warren Johnson.

Medical Branch

Flt. Lt. William Patrick Griffin, M.B., B.Ch., September 4.

Chaplains Branch

‡The Rev. Charles Percy Nott Rowband, M.A., September 6.

‡ To relinquish commission, not liable for reserve service.

The general duties branch officers marked * and † have been selected provisionally for permanent commissions.

UNIVERSITY OF LONDON AIR SQUADRON

The address of the University of London Air Squadron has been changed to:—University of London Air Squadron, Exhibition Road, South Kensington, London, S.W.7.

IRISH FREE STATE AIR CORPS

With its headquarters at Baldonnel aerodrome, Co. Dublin, the Army Air Corps forms a small, but important, part (writes a correspondent) of the Free State Defence Force. The aircraft, mostly of a training type, are Vickers Vespas and Avro Tutors. Four of the latter type were added to the equipment of the unit during the past year. Arrangements have just been completed for the reconstruction of part of the camp at the aerodrome.

The post of Director of Military Aviation was abolished by the Government last year and the unit is now commanded by Major J. Mulcahy. A gliding club has been formed among the personnel of the station and receives official assistance.

During the year one fatal accident occurred at the aerodrome—it was the only one in the country—and Lieutenant Michael Kennedy was killed while practising attacks on a ground target.

No. 10 SQUADRON

The ninth annual reunion dinner of No. 10 Squadron, R.F.C. and R.A.F., will be held in London on April 4. It is open to all ranks. Tickets 5s. 6d. Apply to Mr. A. F. Williams, "Rozel," Amersham, Bucks.

WINGS

The flying badge will be awarded to pupil pilots undergoing the new flying training course at the end of the first term at a flying training school, subject to their passing the air tests and ground examinations. The authority for the award will be the air or other officer commanding.

CIVIL D.F. STATIONS

Service aircraft fitted with medium frequency wireless telegraphy or radio telephony are permitted by a new order to work with the civil aviation ground stations at Hull, Newtownards, Bristol, and Renfrew for direction finding. Communication for any other purpose is forbidden except in emergencies.

AIR FORCE LIST

The March issue of the *Air Force List* has now been published. It can be purchased (price 2s. 6d.) from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

FLYING ACCIDENT

The Air Ministry regrets to announce that Lt.-Cdr. George Alexander Turner Laing, Royal Navy, lost his life as the result of an accident which occurred near Gibraltar on March 5, to an aircraft belonging to H.M.S. *Furious*. Lt.-Cdr. Laing was a passenger in the aircraft. The pilot, Lt. T. C. G. Holford, R.N., F/O., Royal Air Force, and the other passenger, Lt. G. N. Beaumont, R.N., are uninjured.

PERMANENT OFFICERS FOR SPECIALISATION

The undermentioned officers holding permanent commissions have been selected to attend specialist courses during 1936-37.

FOR ENGINEERING COURSE

F/O.s A. P. Chamberlain, T. G. L. Gale, S. J. Marchbank, J. C. Pope, D. Price, J. K. Rotherham, G. E. Watt, R. A. C. Carter, L. W. Burgess, R. T. Gething, R. G. Stone.

FOR SIGNALS COURSE

F/O.s D. R. Evans, H. G. Leonard-Williams, C. C. Morton, A. G. Powell, M. K. D. Porter, P. R. Robinson, G. L. S. Griffith-Jones.

FOR ARMAMENTS COURSE

F/O.s F. C. de la P. Beresford-Peirse, I. G. Mackay, D. S. Kite, P. de G. H. Seymour, D. R. Shore, H. Y. Humphreys, E. D. M. Nelson, A. N. Combe, L. Coulson, A. Golding, S. P. A. Patmore, E. B. C. Davies, W. R. Brotherhood, C. R. D. L. Lloyd.

FOR PHOTOGRAPHY COURSE

F/O.s D. G. Keddie and C. G. R. Lewis.

FOR NAVIGATION COURSE

F/O.s A. W. B. Barrett, D. Michell, A. F. Johnson, T. H. Rolfe, R. H. Shaw.

ROYAL AIR FORCE GAZETTE

London Gazette, March 3, 1936

General Duties Branch

Lt. E. D. Joyce, Royal Artillery, is granted a temporary commission as Flying Officer on being seconded for duty with the Royal Air Force (February 18); Lt. Cdr. C. John, R.N., is reattached to the Royal Air Force as a Flight Lieutenant, with effect from February 20 and with seniority of January 1, 1933.

The following Flying Officers are promoted to the rank of Flight Lieutenant:—W. R. Wills-Sandford (January 26); A. F. McKenna (February 12).

The following Pilot Officers are promoted to the rank of Flying Officer:—A. Green (January 14); P. W. Ashton, W. A. Hughes, C. Charlton-Jones, G. A. V. Clayton, T. R. Manson (January 28).

Sqn. Ldr. M. F. Browne is placed on the retired list on account of ill-health (March 4); the permanent commission of P/O. A. B. Rae is terminated on cessation of duty (February 26).

Stores Branch

F/O. W. J. B. Elliott is promoted to the rank of Flight Lieutenant (January 10).

Accountant Branch

W/O. P. J. Holt is granted a permanent commission as Flying Officer on probation, with effect from and with seniority of February 17.

Medical Branch

Flt. Lt. A. L. St. A. McClosky, M.R.C.S., L.R.C.P., is promoted to the rank of Squadron Leader (March 1).

Miscellaneous

F/O. (Honorary Flt. Lt.) C. R. Richdale is promoted to the rank of Flight Lieutenant (February 15).

Commissioned Engineer Officer

W/O. B. H. Rolles is granted a permanent commission as Flying Officer on probation, with effect from February 18 and with seniority of September 19, 1935.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

Flying Officer N. Foster-Packer is transferred from Class A to Class C (February 15).

SPECIAL RESERVE

General Duties Branch

P/O. H. F. Remnant is promoted to the rank of Flying Officer (September 30, 1935).

Medical Branch

Flt. Lt. D. S. Buchanan, M.A., M.B., Ch.B., relinquishes his commission on completion of service (February 12).

AUXILIARY AIR FORCE

General Duties Branch

No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—Baron Willoughby de Broke, M.C., is granted a commission as Squadron Leader and appointed to the command of the squadron (March 1).

Accountant Branch

No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—P/O. E. A. Titley is promoted to the rank of Flying Officer (February 5).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain.—J. C. Russell, D.S.O., to R.A.F. Station, Aldergrove; to command, 28.1.36.

Squadron Leader.—O. R. Gayford, D.F.C., A.F.C., to D.O.I., Dept. of C.A.S., Air Ministry; for Air Staff duties, 24.2.36.

Flight Lieutenants.—V. H. Clift, to Marine Aircraft Experimental Establishment, Felixstowe, 27.2.36. E. A. C. Britton, D.F.C., to No. 7 Flying Training School, Peterborough, 24.2.36.

Flying Officer.—C. H. B. Bullock, to No. 3 Armament Training Camp, Sutton Bridge, 27.2.36.

Acting Pilot Officers.—M. Beckett, to No. 57 (B) Squadron, Upper Heyford, 24.2.36. J. Vivian, to No. 4 (Army Co-operation) Squadron, South Farnborough, 29.2.36. H. A. R. Holford, D. Nolan-Neylan, R. Williams, to No. 10 (B) Squadron, Boscombe Down, 29.2.36. N. A. N. Bray, L. E. Cryer, T. W. C. Fazan, to No. 13 (Army Co-operation) Squadron, Old Sarum, 29.2.36. G. A. Corder, J. A. Kent, to No. 19 (F) Squadron, Duxford, 29.2.36. A. J. Trumble, to No. 56 (F) Squadron, North Weald, 29.2.36. J. A. O'Neill, A. M. Smith, E. H. T. Thwaites, to No. 99 (B) Squadron, Mildenhall, 29.2.36. M. S. Bocquet, J. W. H. Radice, C. S. Darwood, to No. 111 (F) Squadron, Northolt, 29.2.36. T. M. Evans, A. D. C. Fair, A. W. Fletcher, R. R. Holder, C. G. Isacke, G. F. Lerwill, O. R. C. Moseley, J. B. Russell, to School of Air Navigation, Manston, 29.2.36.

Accountant Branch

Flight Lieutenant.—S. C. Wyatt, to R.A.F. Station, Hendon, 27.2.36.

Flying Officers.—K. Fraser, to R.A.F. Station, Aldergrove, 28.1.36. P. J. Holt, to R.A.F. Station, Biggin Hill; on appointment to a permanent commission, 17.2.36.

Medical Branch

Squadron Leaders.—L. Freeman, to R.A.F. General Hospital, Hinaidi, Iraq; for duty as Medical Officer, 16.2.36. T. R. S. Thompson, to R.A.F. Station, Andover; for duty as Medical Officer, 27.2.36.

Flight Lieutenant.—F. I. G. Tweedie, to School of Army Co-operation, Old Sarum, 28.2.36.

Flying Officer.—W. J. L. Dean, to R.A.F. Station, Biggin Hill, 26.2.36.

Commissioned Engineer Officers

Flying Officer.—B. H. Rolles, to Reception Depot, West Drayton; on appointment to a permanent commission as Flying Officer on probation, 18.2.36.

Chaplains Branch

Rev. P. J. Macken, to R. A. F. Depot, Uxbridge; on appointment to a short service commission, 3.2.36.

A GREAT WAR GAME

THROUGH the courtesy of the Soviet Ambassador *Flight* was privileged to see the official film record of the large-scale Red Army manœuvres held round Kiev (Ukraine) last September. It is a most impressive documentary picture and reveals the great Soviet war machine exercising its many and varied arms.

Apart from the air operations, with which we are chiefly concerned, infantry, cavalry, artillery and tanks were shown in action. One saw machine guns with their crews appear literally out of the ground as slabs of turf folded back, and after raking the attackers descend to their subterranean retreats. Great amphibious tanks slid into rivers, swam across, and climbed out with alacrity. Real land battleships—tanks, each with a heavy gun in a turret like a warship's—dashed about at amazing speeds. Troop transport lorries, armoured trains—examples of every mechanical vehicle associated with the modern army showed their paces.

The Soviet Air Force was chiefly represented, so far as one could see, by three types of aeroplane. There were the great four-engined ANT bomber-transports with tandem-wheeled undercarriages and corrugated metal coverings; the R5 general purpose two-seater (this type was much in evidence) and quite up-to-date radial-engined single-seater-fighters.

The open nature of the country permitted even the largest machines to "put down" almost at will. Troops, tanks and armoured cars were landed from the big ANT's, the latter being slung beneath the fuselage. But the most amazing, and at times alarming, sight was the mass descent of parachutists behind the enemy lines. Some of these heroes carried small-arms, and others were in charge of the assembly of machine guns and small field guns, the parts of which had been dropped by special parachutes.

A gas attack from the air on Kiev (simulated by aircraft laying smoke trails) was met with the usual siren shrieks and donning of gas masks by the civil population. A great feature was made of the speed with which the streets were degassed and the people returned to a normal existence. The existence of bombs appeared, for the time, to have been forgotten.

The finale showed a great review of all units.

Wisdom in—and on—the Air

THE talk on Tuesday of last week in the B.B.C.'s "Conquest of the Air" series was by Mr. Ivor McClure, of the Air Ministry, whose subject was "Safety." Mr. McClure offered no dry facts or platitudinous statements; instead, an immensely entertaining story, in the A. J. Alan manner, of a flight from Scotland to Liverpool in a light aeroplane. The pilot was one whose method of obtaining a weather report before leaving was to glance at the sky and remark, "That should be O.K." The subsequent adventures—coming out of thick cloud to find the machine whistling past sheep on a mountain side, and so forth—made a grand story and contained all sorts of useful morals.

Aerobatting the Hornet

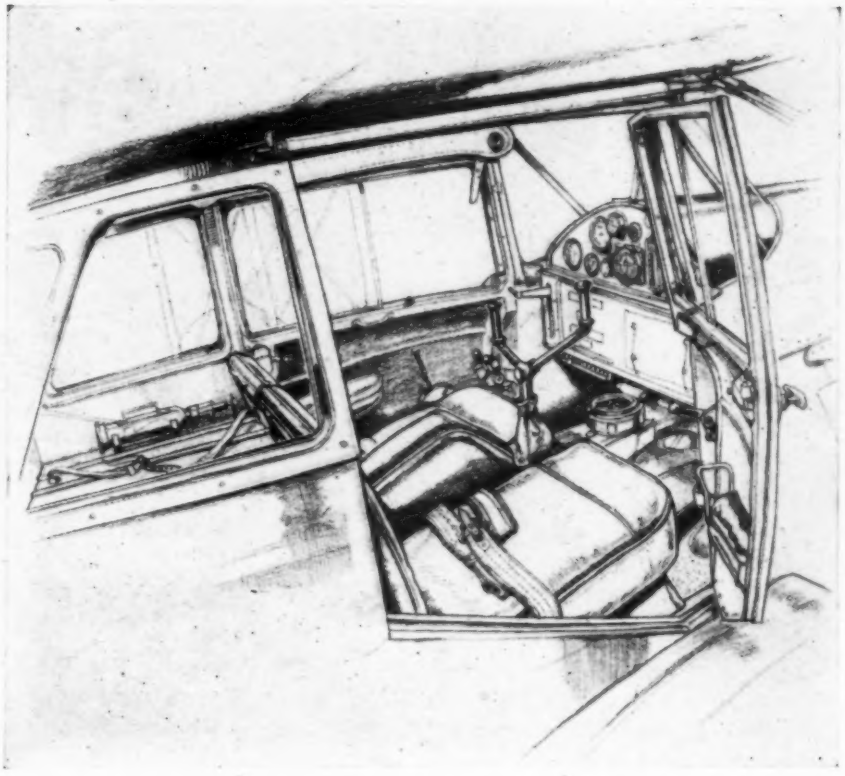
COMMENTING on a statement in the catalogue which is recently issued for the Hornet Moth, the De Havilland Company points out that while the controllability and strength factors of the machine are well in excess of those required for the normal category C. of A., certain additional features have to be embodied in order to qualify for a Certificate of Airworthiness in the aerobatic category.

The Company does not wish to give the impression that the restrictions and provisions of the Certificate of Airworthiness may be abused, and consequently all future catalogues will contain a specific mention to the effect that aerobatics are authorised only on Hornet Moths for which a C. of A. in the aerobatic category has been obtained.

"SQUARE-TIPPED"

Impressions of the 1936 Hornet Moth: A Viceless Landing: "Two Control Flying" in Real Life

By H. A. TAYLOR



The comfortable accommodation, wide field of view and ample luggage space are brought out in this impression of the interior of the new Hornet Moth.

WHEN we have all exhausted the subject of the "ideal light aeroplane," the fact still remains that every one of the six hundred owners and of the thousands of pilots in this country has a different idea. When, last year, the De Havilland Company introduced the Hornet Moth and, so to speak, put their shirt on it as a trainer as well as an "owner," they did so with the knowledge that it would be impossible to please everybody.

Not to put too fine a point on the matter, they very nearly failed to please anybody—such is the cumulative effect of idle gossip. The points have now been removed and the gossips should have been silenced! It would be difficult for anyone to criticise the 1936 Hornet as an up-to-date training type, or for the most careless owner to pirouette on a wing tip. Furthermore, the machine retains all those flying characteristics which made the '35 model so pleasant on a cross-country flight.

Landing Practice

Last week, while flying the new Hornet, I made six landings and at least three of them were tackled with deliberate carelessness. Two were made straight off a 50 m.p.h. final approach—the machine can be safely glided at this speed, though 60 m.p.h. is a preferable pace. On my last I held off at an estimated three feet, which turned out to be about four or five, and, in spite of the fact that a gusty breeze was blowing, there appeared to be no tendency for the machine to do more than drop straight down on a level keel. Previous experience with the earlier model had, of course, taught me to bring the stick back in a parallel movement. It certainly appeared to me that it would be possible to carry out a landing according to a book of rules—holding off until the A.S.I. showed a speed of less than 50 m.p.h. and then pulling the control gently back.

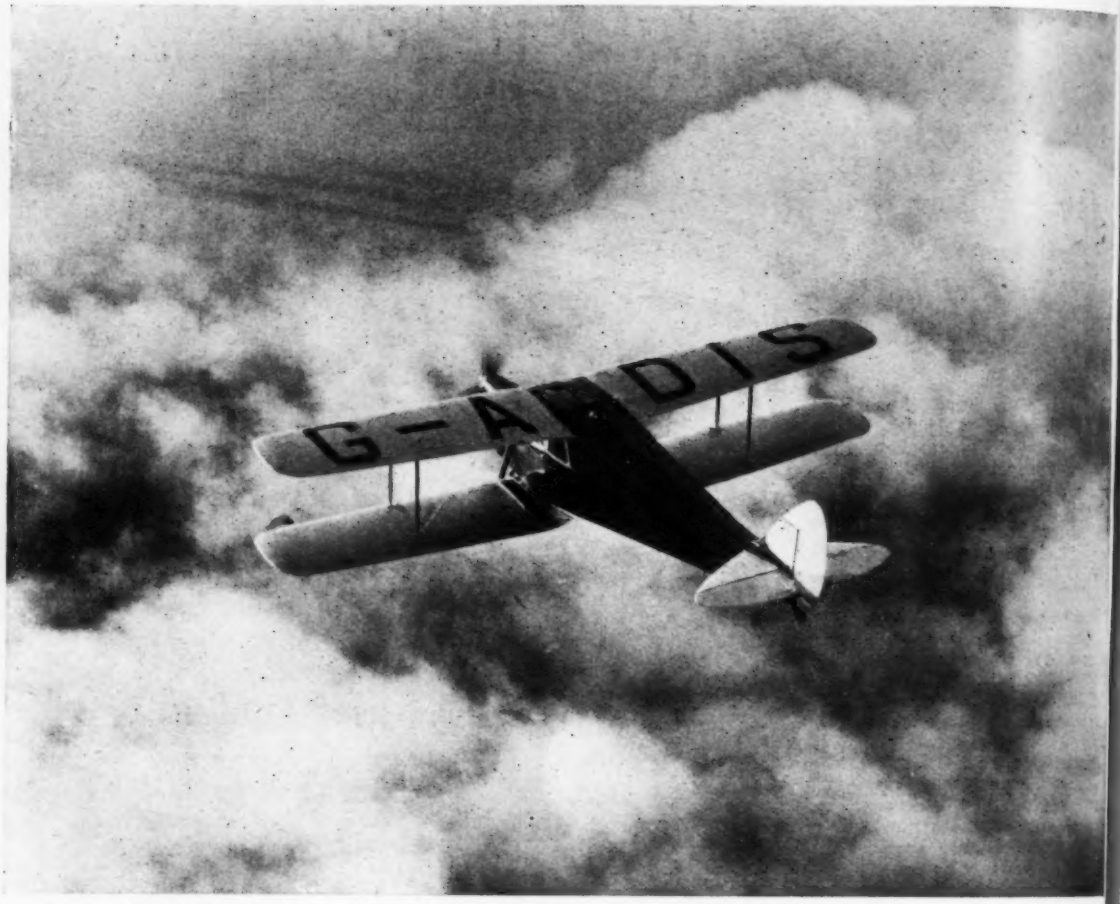
During the flying intervals, I made various stalling experiments at a safe height and found that the Hornet would float indefinitely without dropping its nose at an indicated air speed of 40 m.p.h. so long as the stick was not pulled right back. With the control in one's stomach the nose alternately rose and fell, but a wing did not usually drop for at least ten seconds. A sudden backward movement sometimes precipitated a complete stall and the nose would fall quickly until speed was regained. Either rudder or aileron would lift a falling wing, though the whole machine was, naturally enough, in a somewhat unstable condition. In brief, the natural stall did not appear to be at all violent and some control remained throughout all stalled manœuvres.

Although the ailerons are slightly more sluggish in the new Hornet, its flying characteristics are, as already remarked, similar to those of the 1935 model. Correct turns can be made with the stick alone, and I found that, after a little practice and after trimming the machine directionally at cruising revolutions, it was possible to work up to an almost vertical turn *and to recover therefrom* with my feet on the floor while the "sideslip" needle of

DE HAVILLAND HORNET MOTH

130 h.p. Gipsy Major

Weight (including standard equipment)	1,255 lb.
Disposable load	695 lb.
Length overall	24 ft. 11.5 in.
Span	31 ft. 11.4 in.
Span (with wings folded)	9 ft. 9.5 in.
Height	6 ft. 7 in.
Maximum speed at sea level	121-124 m.p.h.
Cruising speed at 1,000 ft. and at 2,050 r.p.m. ...	103-105 m.p.h.
Endurance (with normal tanks)	6 hr.
Stalling speed	40 m.p.h.
Take-off run in 5 m.p.h. wind	135-175 yds.
Climb to 5,000 ft.	8.25 min.
Service ceiling	14,800 ft.
Gliding angle (air brakes on)	1 in 8
Price	£875



This somewhat unusual flying picture of the Hornet Moth gives a good idea of the upward and rearward view given by the roof windows and also clearly shows the new wing form. (*Flight* photograph.)

the turn indicator remained absolutely central. "Rudder only" turns were made with rather less accuracy.

Finding a really solid mass of cloud between 4,000 and 5,000 ft. I made several interesting experiments in blind flying. Again without using the rudder it was possible to turn on to different courses with accuracy and to hold a constant rate of turn without difficulty. On the rudder alone the speed tended to increase rather badly on any but very gentle turns. The business of flying straight and level in a cloud is the easiest in the world, and I hardly found it necessary to use the turn indicator—which, nevertheless, was essential as a psychological comforter.

Sartorial Interlude

One up, with luggage consisting of one soft hat and a pair of gloves (who *would* fly an open aeroplane?) and without trying very hard, an altimeter height of 1,000 ft. was reached in a few seconds over the minute from a standing start. Actually the climb, at an air speed of 50-55 m.p.h., is quite phenomenal, and the take-off run into a wind of perhaps 15 m.p.h. did not appear to be more than a hundred yards or so.

For a biplane the approach angle is surprisingly flat until the air brakes are used. Most people would probably prefer these to be even more potent, though the Hornet sideslips with the virility customary in all D.H. machines. Only on my first approach did I find it necessary to use more than a shade of flat slip at the very last moment in order to put down just beyond the prohibited area at Hatfield. Nobody would need to have any hesitation about using a small landing ground with the good take-off and safe-slow approach.

One feature of the new Hornet is worth its place in the final paragraph—the mirror. It is large, quickly adjustable and gives a complete view of the sky and horizon behind. There will now be no need to swing round on a wheel to peer at the sky before opening up for the take-off.

Viceroy's Trophy Speeds

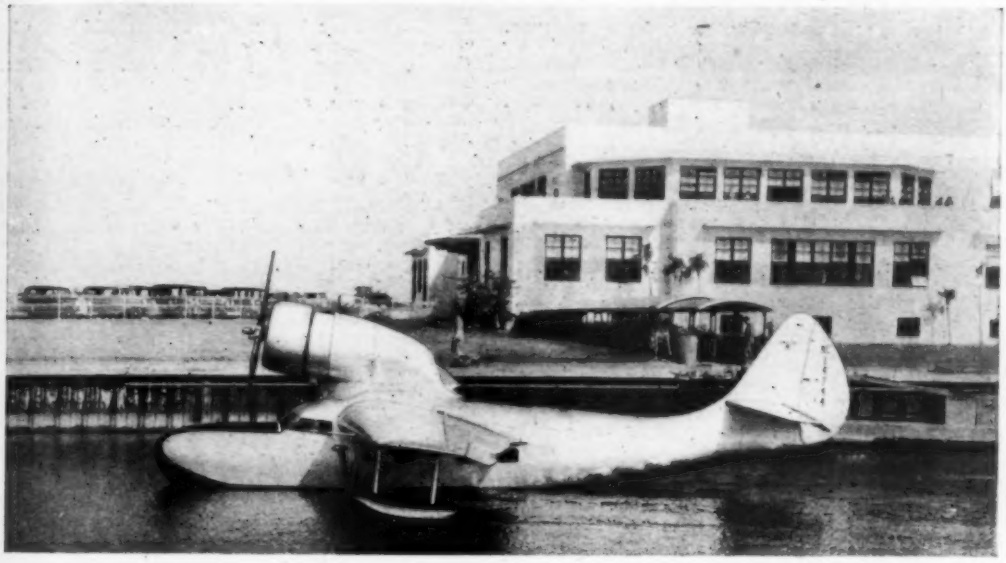
ONE or two interesting points arise from a study of the Viceroy's Challenge Trophy race results, which are given below. The race, of course, was run on two successive days (Madras—Bombay and Bombay—Delhi), the mileages being 722 and 798 respectively.

Only three machines beat their handicap speeds over the entire course and one of these was well below it on the first day's flying.

Pilot and Machine.	Speed on First Day. m.p.h.	Average Speed for Whole Distance. m.p.h.	Handicap Speed. m.p.h.
1. Misri Chand (D.H. Moth)	113.9	113.85	106
2. G. V. Gadgil (D.H. Moth)	112.6	111.9	106
3. A. C. Gagdar (D.H. Moth)	115.0	118.4	117
4. S. K. Dube (D.H. Moth)	96.7	98.0	108
5. C. E. Gardner (Short Scion) ...	120.7	121.0	125
6. N. Vintcent (Miles Hawk)	143.7	143.5	150
7. Sir A. W. MacRobert (D.H. Moth) ...	96.7	97.2	100
8. Capt. A. F. Muir (Percival Gull) ..	151.5	156.0	172
9. R. Vaughan-Fowler (B.A. Eagle) ...	137.5	136.9	153

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



PAN AMERICAN DEBUTANTE. American modernity is the keynote of this view of the first Fairchild Baby Clipper (P. & W. Hornet) moored after its delivery flight to Pan American Airways at the International Airport, Miami. This particular machine will be used between Para and Manaos down the Amazon River.

THE WEEK AT CROYDON

Using the Alternatives : A Tailless Tale : Obstructions While You Wait : Super Salesmen : Strange Cargoes and Problems

THE companies have had to make a certain amount of use of the emergency airports lately, and pilots who have used Gravesend are loud in their praise of the lighting there, consisting of illuminated wind indicator, three 9 kW landing lights (Croydon's are only 6 kW), a neon beacon and electric boundary lights. The organisation for customs, emigration and transport is excellent, and passengers are seldom or never kept waiting.

It is better to make straight for an emergency port in really bad weather than to dither round Croydon in an aerial queue, waiting for a turn to land—which may be useless because the place has closed right down. It is also better to put in at another port than to be the only pilot to arrive at Croydon. He receives no bouquets—only wreaths in due course.

Romance has brightened our lives at Croydon in the past few days. First there was Acting Capt. Richardson, of Imperial Airways, who travelled to Cologne with his bride, and then there was much rushing to and fro between Paris and London by Air France in search of some vital legal document connected with the Ashley-Fairbanks marriage.

Last week someone rang up Imperial Airways and said that he was speaking from a Gloucester Road 'phone box. He had just seen the tailplane fall off an Imperial machine which was heading north, but the machine had continued its journey. Possibly the pilot had not noticed, and he, the informant, thought the company might like to know. There was no Imperial machine in those parts at that time, anyway. Was it a joke, or did some private owner drop a sheet of foolscap overboard?

A Mr. Speirs, of Leicester, aged eighty-two, left by K.L.M. for the Leipzig Fair and returned again during the past week. He has spent a lifetime manufacturing machinery with which to manufacture stockings, and he now thinks it would be a nice change to manufacture aero-engines.

Some sportsman wished to erect two 160-foot chimneys on top of a brickworks beside Gatwick airport, but the Dorking and Horley R.D.C. vetoed this little practical joke. Let us pray that he will not come and put his chimneys up at Croydon. If he did he would probably be asked only to put a couple of pale pink oil lamps on top of them to warn the unfortunate aeronauts.

"The Rollason Men" have been at it again. I am told they have already sold no less than four D.H.90 machines and have other sales in hand of the same class of aeroplane. They have also recently sold a demonstration model Rapide. There is a story of a total stranger who entered the buffet for a bar of chocolate and went out the proud but slightly dazed owner of a second-hand aeroplane. The Rapide, it is understood, is for a private owner who proposes to enter it for the King's Cup race this year. It has an "overload" C. of A.

People seldom realise the sort of things a company's freight department is supposed to know all about. One company, doing a lot of business in the tropical fish line, has every consignment of containers tested with thermometers as soon as it arrives, and then, if necessary, brings the water up to the correct temperature. Then there are day-old chicks which have never had a meal—as these quaint fowl don't eat for twenty-four hours after hatching

Commercial Aviation

—but must have special food at the end of that period. Someone once tried to do a prize cat a good turn with a saucer of milk, but the creature escaped and went to ground under the floors of what used to be "Disposals," where it is said to have been responsible for a considerable increase in the local feline population. A valuable dog, too, let out of its box to stretch its legs, once slipped its collar and stretched its legs at a good 30 m.p.h. across country, pursued by the police and all the more sporting members of the community!

By the way, a change has taken place in British Continental Airways personnel. Mr. J. K. Morton has become chief of the technical staff, and Flt. Lt. A. P. K. Hathersley is now chief pilot. A. VIATOR.

The Alexandria Accident

AT the resumed inquest on the *City of Khartoum* passengers, Major Cooper, Chief Inspector of Accidents for the Air Ministry, gave it as his opinion, pending a fuller technical report, that the accident was caused as a result of fuel shortage following jet alterations, while air locks may have caused faulty gauge readings.

By Correspondence

FOR the benefit of those pilots who are unable to attend the classes in person, Mr. C. W. Martin, of the Imperial School of Navigation, Notting Hall (Park 4509), has started a form of practical correspondence tuition for the navigators' examinations.

Although it might be possible for a hard-working student to plough successfully through the thirty-one books given in the official syllabus, Mr. Martin's experience will enable the pupil to cut down all unnecessary labours and to concentrate on essentials. A series of model answers to previous examination papers have also been worked out.

Incidentally, there are no fewer than 105 entries for this month's examination, and pupils of the I.S.N. constitute a third of this total. Not bad for a comparatively new school.

First Baby Clipper Delivered

WITH the somewhat unhappy name of *Jungle Clipper*, the first Fairchild 91 amphibian (Baby Clipper class) was delivered to Pan-American Airways at International Airport, Miami, a few weeks ago. A 750 h.p. Pratt and Whitney E.-type Hornet is installed in this machine; the second of the series mounts a 760 h.p. Wright Cyclone, and will be delivered to P.A.A.'s subsidiary, China National Airways, for use on the Yangtze River, in China. *Jungle Clipper* is being put on the 1,000-mile Amazon River run between Para and Manaos.

It appears that the wing-tip floats of Fairchild 91s are now fixed and not retractable as in the prototype. The maximum speed is 173 m.p.h. and the cruising speed ranges from 140 m.p.h. at sea level to 162 m.p.h. at 16,000 feet on two-thirds power.

Improvements in Iraq

THE ever-increasing use of Baghdad Airport by the aircraft of the Iraq Petroleum Company, the Anglo-Iranian Oil Company and the operating air lines has resulted in the construction of a number of additions and improvements.

An extension is being built on one side of the hangar, while on the other store rooms and workshops for the use of the air companies are nearing completion. The floor of the hangar will be greatly improved by the laying of bitumen, as will be the expanse between the airport building and the hangar, which is a sea of mud after heavy rains.

On the north wing of the building five additional bedrooms are being built, the present accommodation being quite inadequate for flying crews, let alone passengers. On the south wing administrative offices and a meteorological office have been erected.

Plans for runways have been drawn up, but exceptionally heavy rainfall early in the year has necessitated the postponement of this work.

Turning to another part of Iraq, Margil, which is to be the airport of Basrah, is teeming with workmen. On completion it will be one of the finest airports in the East, if not in the world. It is being constructed by the Basrah Port Trust, who have gone very thoroughly into the matter, seeking the advice of experienced pilots, the Air Force and engineering experts, and examining in detail European airports.

The most modern form of aerodrome lighting is being installed by the Westinghouse Company, excellent runways are being built, a very large and up-to-date administrative building is being erected, and there is talk of a first-class hotel being constructed on the aerodrome. Large hangars, a wireless station with D/F apparatus, and automatic control of all lighting from a panel in the traffic officer's control room will form part of the aerodrome equipment.

Linking the Islands

SINCE March 1 Northern and Scottish Airways have been operating a week-day service to Campbeltown and Islay (leaving Renfrew at 9.30 a.m.), another on Tuesdays and Thursdays between Renfrew (9.30 a.m.), Skye, North Uist and South Uist, and a third, on Saturdays and Mondays, between Renfrew (8.45 a.m.) and the Isle of Man (Hall Caine Airport, Ramsey).

This is Air Freight!

CANADIAN AIRWAYS have, it is stated, entered into a contract with Argosy Gold Mines for the transportation, after the Spring, of 500 tons of miscellaneous freight from Goldpines, on Lac Seul (north-west Ontario), to Casummit where mining operations are in progress. The distance is seventy miles, and the freight—largely fuel oil—will be transported from the rail-head at Hudson (C.N.R.) to Goldpines by water. Canadian Airways propose to use their Junkers Ju.52 as much as possible on this contract, but a lot of it will be carried by ordinary aircraft.

The Empire Fleet

A NEW system of naming aircraft is to be adopted by Imperial Airways for their fleet of forty-one flying boats and landplanes which are now being built for use on the Empire air routes. Hitherto Imperial machine names have begun with the initial letter of the constructor's name, the particular class of aircraft being known by the name given to the first of the type.

In the new system an alphabetical class sequence will be used and the letter C has been allotted to the new Empire flying boats, which will, in future, be known as C class machines. The company's classical, astronomical and geographical expert mus have had an unhappy time choosing the names for twenty-eight flying boats. Who was Cassiopeia anyway? (The mother of Andromeda.—Ed.) Mere mortals will now have no assistance in the business of remembering the type of machine from the study of a name.

Unsubsidised Paris Services : Commons Question

IN the House of Commons last Monday, Mr. O. E. Simmonds asked the Under-Secretary of State for Air whether he had protested to the French Government against its threat to withdraw the permits to fly to France from unsubsidised British air transport companies.

Sir Philip Sassoon said he understood that the attitude of the French Government was that, if the authorisations in question were to be renewed, a commercial agreement regarding time-tables and rates must be concluded between all the French and British companies operating services on the London-Paris line. In view of the terms of the International Air Convention, the companies concerned had been advised to make every endeavour to satisfy the French condition.

Mr. Simmonds: Is it not a fact that these unsubsidised companies are running at lower rates than the subsidised companies and are making profits, and yet, so far as can be seen, His Majesty's Government are prepared to sacrifice these companies in order that they shall not create an unfavourable impression on the French Air Ministry? Will my right hon. friend ensure the House that he will maintain the rights of those unsubsidised companies against the French Air Ministry?

Sir Philip: This case is one which is covered by the Air Navigation Convention, and the French authorities are within their rights.

Mr. Simmonds: Could not my right hon. friend emphasise to the French Government that the British Government regard the rights of these unsubsidised companies as equally important as those of the subsidised companies?

Sir Philip: Naturally, we regard the rights of all companies as important. This is a question of their entering into negotiations with the French Government over rates and time-tables.

Captain Sir William Brass asked if Sir Philip would see that the French Government got his answer.

HERE and THERE

"Dryad's" De-icer

AS already reported in *Flight*, a D.H.86, *Dryad*, is one of the Imperial Airways' machines which are being or have been fitted with de-icing equipment—actually, the Dunlop Anticer already described.

In the case of the 86 the porous leather covering and the pipes are attached to the leading edges of the wings, tail-plane and fin. Including three gallons of the anti-freezing mixture—sufficient for five hours' flying in ice conditions—the whole outfit weighs only 65 lb.

A Leicester Occasion

IT seems that the Leicestershire Aero Club can be depended upon to do things well. Last Friday's dinner and dance at the Grand Hotel, Leicester, was no exception, and the proceedings were not delayed by a lengthy toast list.

Actually, there were no official speeches. Mr. W. Lindsay Everard, M.P., made short and happy references to the guests and to the various people who had helped to bring the club to its present importance and efficiency, and asked two distinguished guests, Lt.-Col. Sir Francis Shelmerdine, the D.G.C.A., and Councillor R. Hallam, the Lord Mayor of Leicester, to reply.

The former explained that praise was a pleasant change, since already the local papers were talking about a new Lord Mayor. (Apparently the rates have gone up in recent months!) Sir Francis said that the honour of knighthood recently conferred upon him was all the more valuable to him because he felt that civil aviation in general was thereby being shown its true value. He spoke of the importance of the clubs at the present time and mentioned that the Leicestershire Aero Club was now in its seventh year.

Thereafter the members and guests deployed towards the dancing floor, which was occupied until the small hours by a vast multitude who made appropriate movements, helped by a dance band which was certainly above the average in technical skill.

Air France's New Terminus

AN arrangement has been concluded between Air France and the Dorchester Hotel, Park Lane, by which the latter will become the London terminus for their coaches to and from Croydon aerodrome.

The new arrangement comes into force on April 19, the date of the opening of the Air France summer time-table. Passengers have been demanding a more central point of departure and arrival in London than that offered by Horse-ferry House, Millbank, and a hotel offers special facilities for early morning departures and arrivals late at night, such as, for instance, passengers who have had a long day's flying from Athens. The new terminus will be the most centrally situated departure station of any air line operating from any aerodrome round London.

The premises in the Haymarket will continue to be used by Air France as their general offices and booking department.

Meir's New Clubhouse

ON Friday and Saturday the North Staffordshire Aero Club celebrated the opening of its new clubhouse in fitting style. The president, Mr. C. R. Anson, well known as a Rapide private owner, attended to the opening ceremony, supported by Lord Sempill and the Lord Mayor of Stoke-on-Trent.

Apparently at Friday's dinner and Saturday's luncheon only one speaker, Ald. Austin Brooke, gave due credit to the club for the fact that Stoke has an airport at all. However, from all accounts it was a good party.

Still More Traffic

JANUARY'S steady traffic increase has been maintained throughout February at Heston. Movements of private aircraft totalled 908, as compared with 705 in February, 1935. Commercial aircraft movements had increased from 517 in February, 1935, to 909 in February, 1936. Total aircraft movements for the month were 1,817, as compared with 1,222 in February, 1935.

Air Commerce is to add a D.H. Dragonfly to its existing equipment of Monospars and Leopard Moths. This purchase is typical of the increasing tendency of air taxi companies to cater for the comfort of passengers by working with larger, and in many cases twin-engined, aircraft.

British-American Air Services recently took a director of the P. and O. with two engineers to Gibraltar, where the *Strathmore* was delayed with engine trouble. A telephone call was received late at night, and the aeroplane, a D.H. Rapide, piloted by Mr. V. J. Wheeler, took off at 8.30 next morning, reaching Malaga (the nearest aerodrome to Gibraltar) at noon on the following day.

Pou Corner

ON Easter Monday the Aero-8 Flying Club propose to hold a *Pou* rally at Canute Air Park. All owners of English-built *Pous* and, in fact, anyone else who is interested, are invited to attend this event, which will probably be the first of its kind in England.

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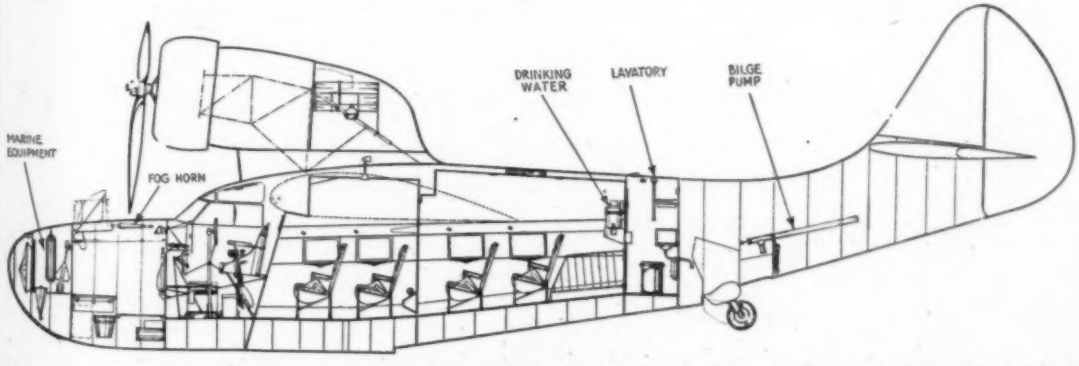
The preliminary arrangements for the *Pou* rally to be held at Broadway Air Park, Worcester, early in May are now well advanced. Anybody interested should communicate with Mr. Horace Wright, 15, Merston Green, Evesham, Worcester.

* * *

A suggestion has also been put forward that a *Pou* rally should be held in Gloucestershire on Whit Monday. It is proposed that prizes be given for the *Pou* that flies the longest distance to the rally, the fastest one, and the one with the most "gadgets." Those interested are asked to communicate as soon as possible with Mr. R. W. Hughes, "Cloddyincre," Hatherley Road, Cheltenham.

* * *

Yet another reader wishes to get into touch with *Pou* enthusiasts in the Hampstead area, with the idea of forming a club. Letters should be addressed to Mr. R. M. Lanman, 29, Minster Road, West Hampstead, N.W.2.



Points of interest to be seen in this elevation of the Fairchild Baby Clipper include the anchors and drogues in the bow compartment, airscrew guard over the forward hatch, accommodation for passengers and crew, retracting tail wheel and the general compactness of the whole layout. The engine is a 750 h.p. nine-cylinder Hornet radial.

THE INDUSTRY

Ignition in India

IN the Viceroy's Cup Race, held over a 1,520-mile course round India on February 14 and 15, Lodge plugs were fitted to the three D.H. Moths which finished first, second and third, and to the Percival Gull which made best actual time of the day.

Inside the Empire Boats

A FURTHER interesting item of information regarding the Short Empire flying boats (the internal equipment of which was described in *Flight* last week) concerns the interior decoration. The design of this is the work of Mr. Brian O'Rorke, whose interior decoration of the Orient liner *Orion* has been highly praised.

The design and manufacture of the adjustable passenger seats is the work of Imperial Airways, Ltd.

Alloy Specialists' Proposed Issue

AT an extraordinary general meeting of James Booth and Company (1915), Ltd., to be held to-day in Birmingham, a resolution will be proposed that the capital be increased from £500,000 to £750,000 by the creation of 250,000 ordinary shares of £1 each, and that of such additional capital 50,000 shares shall be ordinary shares ranking *pari passu* with the existing issued ordinary shares.

The balance sheet shows a net profit for the year ended December 31, 1935, of £67,285 4s. 11d.

Honour for Hamilton Airscrew Engineer

MR. FRANK WALKER CALDWELL, engineering manager of the Hamilton Standard Propeller division of the United Aircraft Manufacturing Corporation, is to receive the Sylvanus Albert Reed Award for 1935.

The award was endowed with a bequest of $10,000 by the late Dr. S. A. Reed, a pioneer in the development of metal airscrews. The award is presented annually "for a notable contribution to the aeronautical sciences resulting from experimental or theoretical investigations, the beneficial influence of which on the development of practical aeronautics is apparent."

Mr. Caldwell received the award for "increasing the effectiveness of aircraft through development and improvement of controllable and constant-speed propellers."

In 1916 Mr. Caldwell was in charge of the airscrew department of the Curtiss Company. Later he became chief of the Propeller Engineering Division of the Army Air Service, and in 1929 was appointed chief engineer of the Standard Steel Propeller Company, predecessor of Hamilton Standard Propellers, of which he is now engineering manager.

The majority of readers of *Flight* will not need reminding that licences for the British manufacture of both controllable-pitch and constant-speed Hamilton airscrews are held by the De Havilland Company, who are now actively engaged in manufacture of types suitable for British engines and aircraft.

Softening Several Million Blows

WHAT is stated to be the biggest contract for rawhide hammers ever placed has been awarded by the Air Ministry to the British Rawhide Belting Co., Ltd., of Hythe Road, Willesden, London, N.W.10.

Tube-bending

A CATALOGUE issued by Hunton, Ltd., 114-116, Euston Road, London, N.W.1, specialists in metal-working machinery, deals with tube-bending equipment. The "Rundus" machine, it is stated, will bend all possible types of piping cold without filling, without folds and without distortion of section.

A Steel Appointment

IT is announced by the English Steel Corporation, Ltd., that Mr. A. G. E. Briggs, special director and sales manager of that company, is appointed a director of the recently reopened Darlington Forge, Ltd.

Mr. Briggs served his apprenticeship at the Vickers works and subsequently joined the sales staff at the London office of Vickers, Ltd. After the formation of English Steel Corporation, Ltd., he was for a short time with Ibbotson Bros. and Co. Ltd., and made a tour of the South American States on their behalf. He rejoined the Vickers Group as sales manager of English Steel Corporation three years ago, and was appointed a special director in February, 1935.

AERONAUTICAL PATENT SPECIFICATIONS.

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.).

Published March 12, 1936.

15806. HAENLE, K.: Ornithopter (442,667).
1703. GOETZ, C. C.: View-finders for aircraft (442,806).

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

FIRE STATION MOTOR SUPPLIES, LTD. (310,905).—Private company registered February 27. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in aircraft of all kinds, automobiles, etc. The directors are: Gilbert A. Jones, 66, Stockfield Road, Acock's Green, Birmingham; Horace W. Smith, 35, Kedleston Road, Hall Green, Birmingham.

AIRCRAFT ACCESSORIES, LTD. Private company registered February 27. Capital, £100 in £1 shares. Objects are to carry on the business of manufacturers of aircraft, parts and accessories, etc. The first directors are to be appointed by the subscribers. Solicitors: Denton Hall and Burgin, 3, Gray's Inn place, London, W.C.1.

CHANNEL GLIDING CLUB, LTD. Private company, registered March 2. Capital, £200 in £1 shares. Objects: To promote and encourage gliding, soaring and aerial navigation in all its forms, and the construction of aerial conveyances of all kinds, etc. The directors are: Christopher M. C. Turner, "Charlton," Hawkinge, Folkestone; Felix G. Whitnall, 20, High Street, Cheriton, Kent; Leonard Griffiths, 132, Seabrook Road, Hythe, Kent.

PUBLICATIONS, ETC., RECEIVED

Machine Drawing for Students, by F. J. Pryer. Aeronautical Engineering Series. Price 7s. 6d., Sir Isaac Pitman and Sons, Parker Street, Kingsway, London, W.C.2.

British Legion Annual Report and Accounts, 1934-35. Haig House, 26, Eccleston Square, London, S.W.1.

England Have My Bones by T. H White. Price 8s. 6d. W. Collins Sons & Co. Ltd., 48, Pall Mall, London, S.W.1.

Forthcoming Events

Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing of Aircraft" by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.
Mar. 19. R.Ae.S. Students' Section Lecture: "The Monoplane Solution," by R. C. Abel, 7 p.m., R.Ae.S. Library.
Mar. 20-22. Re-union of Halton Belgium Tour parties, High Leigh, Hoddesdon, Herts.
Mar. 23. R.Ae.S. Lecture: "Welding," by R. H. Dobson, Institution of Electrical Engineers, 6.30 p.m.
Mar. 26-29. Yorkshire Gliding Club: Members' Meeting.
Mar. 31. R.Ae.S. Students' Section Lecture: "The Test Pilot's Job," by K. G. Seth-Smith, 7 p.m., R.Ae.S. Library.
April 15. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Charlton, 8 p.m., Armstrong Siddeley Canteen.
April 17. Norfolk and Norwich Aero Club: Annual Dinner and Dance.
April 20. "New Light on Strength of Materials Afforded by Modern Physics," by Dr. H. J. Gough. Institution of Electrical Engineers, 6.30 p.m.
April 24. Bristol and Wessex Aeroplane Club: Annual Ball.
April 28. R.Ae.S. Students Section Lecture: "Application of Aerodynamics to Mechanical Engineering," by J. L. B. Jones, 7 p.m., R.Ae.S. Library.
May 15-18. Yorkshire Gliding Club: Open Meeting and Competitions.
May 15-June 1. Stockholm Aero Show.
May 23. Empire Air Day.
May 27-June 4. Austrian Aero Club: Whitsun Tour.
June 6. R.A.F. Flying Club: Annual Display.
June 6-14. Czechoslovakia Aero Club: Tour.
June 20. Brooklands Flying Club: "At Home."
June 27. Royal Air Force Display, Hendon.
July 10 and 11. King's Cup Race.
July 18. Portsmouth Aero Club: Isle of Wight Race.
August 1-2. Yorkshire Gliding Club: Open Meeting.
August 15-30. Yorkshire Gliding Club: Open Meeting and Competitions.
September 5-6. Aero Club of Hungary: Week-end Aerien.
Nov. 13-29. Fifteenth International Aero Exhibition, Paris.